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Front Cover
The mountain lion in Libby Berry's painting also answers to the name of cougar, panther, puma and catamount. This large, secretive carnivore is a master at skulking about unseen.

Inside Front Cover
Dick Ellis' photograph of Mount Haggin Wildlife and Recreation Area proves that the area's recreational and wildlife values are rivaled by its scenic diversity.

Back Cover
Something about the grizzly bear attracts, pulls at the emotions and stimulates the concern, interest and attention of many people. Shirley Johnson's painting underscores the majesty of the big bear.

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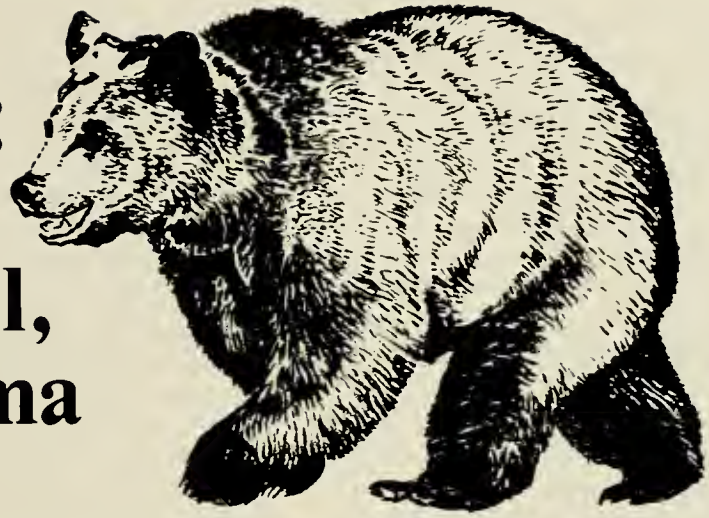
Grizzly Bear: The Animal, the Symbol, the Enigma



IN MONTANA, no wild animal is a greater management challenge than the grizzly bear. It is also the most popular wildlife subject in the western half of the state, as witnessed by the following facts:

- Since its release, the 1975 grizzly movie, "Room to Live," has been the most frequently requested film in the Department of Fish, Wildlife and Parks' 103-movie library.
- Jack Olsen's 1969 book, "Night of the Grizzlies," is annually one of the best-selling paperbacks in Montana.
- On Aug. 14, 1981, Glacier National Park, with Representatives John Seiberling, D-Ohio (chairman of the House Subcommittee on Public Lands and National Parks), Beverly Byron, D-Maryland and Pat Williams, D-Montana, hosted a congressional hearing on grizzly management that filled the meeting room, lasted nearly five hours and had so much testimony that the last 10 speakers were limited to three minutes each.
- The Kalispell City-County Library has 79 copies of 11 different books about grizzlies, not counting seven books for young people on the subject. Most of these books are limited to 10-day circulation because of demand. There are currently 14 grizzly books being offered for sale, compared with five for elk.
- On Dec. 4, 1981, at the annual convention of the Montana Wilderness Association in Great Falls, over 200 people filled the Sheraton Hotel ballroom to see a five-year old movie about grizzly research in Yellowstone National Park during the late 1960s. It was introduced by Montana grizzly researcher John Craighead.
- On the average, both the Great Falls Tribune (circulation 46,000) and the Missoulian (36,000) mention the subject of grizzly bears at least once a week.

Clearly, there is something about the big bear that attracts, pulls at the emotions and stimulates the concern, interest and attention of many people. The best-attended meetings of the Libby Rod and Gun Club and Flathead Wildlife, Inc. (Kalispell) during the last three years have been those when the program was about grizzly management. Two years ago, the Eureka Rod and Gun Club filled the community room until past midnight listening to and questioning grizzly researcher Dr. Charles Jonkel. At a recent meeting, the tiny Noxon Rod and Gun Club digressed an hour and a half from its planned program while every one of the members voiced an opinion on the subject of grizzly relocations and road closures. That is perhaps the most striking characteristic of grizzly management: Almost *everyone* has an opinion.

The grizzly is one of the main elements in the controversies surrounding the Ketchikan timber sale west of Glacier National Park, the widening of U.S. Highway 2 northeast of Columbia Falls, oil and gas exploration in and near the Bob Marshall Wilderness and the ASARCO mining project south of Troy. Grizzlies also figure in mineral exploration northwest of Thompson Falls in the Cabinet Mountains, in the Forest Service's (FS) management plans for a dozen forests in four states, in plans to pave the road along the North Fork of the Flathead River and around Hungry Horse Reservoir, in the handling of garbage in at least 10 different areas and in subdivision planning in a dozen counties. They also play a part in eagle viewing along Glacier Park's McDonald Creek, in lodgepole pine salvage sales on at least 20 FS ranger districts, in the debate surrounding at least 10 wilderness study areas, in Glacier Park management plans, in predator control work, in fire control, in road closures, in range management and in new development proposals introduced almost every month.

TWO IMAGES

In discussions with all kinds of people, in magazine articles, in impact statements, in news comments, in books, in letters to the editor and in public hearings, the grizzly bear emerges as an animal with two different images.

One image is the large, muscular, heavily built creature whose structure, behavior and physiology allow it to take advantage of almost any feeding situation, habitat and

by Mike Aderhold

photo: Dean Biggins

food supply. It is the slow-developing, low-producing, relatively long-lived beast that is difficult and expensive to study. It is the only North American land mammal indisputably able and occasionally inclined to threaten man. It is the rare survivor that has a population of less than 1,000 in Montana and a range, south of Canada, of less than 1% of what it was just 200 years ago. It is the subject of a challenging hunt, a memorable trail experience or a rare wildlife observation.

Occasionally, it is the individual animal with an unusual story: Colorado's Old Clubfoot, Utah's Old Ephraim, Montana's Geifer Creek Grizzly or one of the many unnamed "problem" bears that made the news and whose memory survives in some human minds to be celebrated time and again.

The second image is the grizzly as a symbol. To many, it is the living manifestation of wilderness. The epitome of primeval mountains and forests, and the remainder of the elemental relationship between man and wild animals. The breathing synonym for the romantic West, freedom, wilderness and the risk and adventure of "pack'n in." A nostalgic sign of a cleaner, simpler, more exciting time. To some, the great bear is the quintessential wildlife species. Over and over, one hears words to the effect that "... if a piece of country will carry grizzlies, it will carry all the rest...." To a few, the grizzly is a spiritual force, a sacred presence, a subject of religious concern.

To others, the bear is a symbol of "wildlife in the way." It is held up, in some circles, as a good example of overregulation, ivory tower thinking and wildlife management out of control. These people see it as the perfect example of the "wildlife wrench" used by weekend lawyers to jam the gears of "progress." More traditionally, the grizzly has been maligned as one of the forces that made settlement of the West painful, that preyed on the fruits of man's labor and stood in the way of civilization.

The problem in dealing with grizzly the animal is our ignorance. All the grizzlies south of Canada would fit in a school gym yet they are spread over an area the size of West Virginia. It's possible to learn more about a deer or elk herd in a year than you can learn about grizzlies in 10 years. They are rare, wide-ranging, adaptable, unpredictable and they can be dangerous. Studying them is often an exercise in frustration. In any monitoring program, the sample size is always small, the data points are never enough and conditions vary

"To many, the grizzly is the living manifestation of wildness."

so much from one place to another that it is hard to draw valid conclusions. It is often difficult to formulate management principles from such weak information, and grizzly research has become almost intolerably expensive. A log of good information has been developed over the last quarter of a century, but it is woefully inadequate to answer all of the questions being asked.

The problem in dealing with grizzly the symbol is that the animal is almost impossible to define and discuss rationally; even if one could, so many people have such ingrained views that it might not make any difference. So many different social, aesthetic, cultural, spiritual, ecological, recreational, educational and scientific values are involved that it is hard to hit everyone's perspective. One's upbringing, education, experience and peers all influence one's attitudes about grizzlies. Reason, logic and economic and scientific fact are often discounted, leaving emotion and self-interest to settle the issue.

THE ENDANGERED SPECIES ACT

During settlement of the West, the grizzly was regarded as an enemy; it was condemned as a result of actual or anticipated conflict with man. In the last half-century, this attitude began to change and, to many, the grizzly became a valuable indicator of an important wildlife and wildland resource this country was losing.

Prompted by the wave of environmental awareness beginning in the 1960s, Congress attempted to forestall what appeared to be the inevitable destruction of numerous wildlife species by passing endangered species acts in 1966, 1969 and 1973. Each successive act built on the preceding one and was broader and stronger. The Senate passed the third act unanimously, 92-0, and the House passed it 355-4. None of the dissenters was from the West.

The Endangered Species Act of 1973, and a subsequent rule in the Federal Register (June 28, 1975) by the U.S. Fish and Wildlife Service (USFWS) classified the grizzly as "threatened" in the lower 48 states, effective Sept. 1, 1975. Among other things, "threatened" status for the grizzly imposed a limit on man-caused mortalities in northwestern U.S. grizzly populations to an annual quota of 25 bears. Threatened status also required the delineation of "critical habitat." In 1976 and 1977, wildlife agencies wrestled with the

"All the grizzlies south of Canada would fit in a school gym yet they are spread over an area the size of West Virginia."

task of defining just what "critical" meant and where such lands were. While it was possible to roughly outline occupied, intermittently occupied and potential ranges, one could not say with certainty what was critical or what levels of disturbance, modification or destruction would be significantly harmful.

This whole exercise was steeped in controversy because of two brief sentences in Section 7 of the Endangered Species Act which requires all federal agencies to "insure" that federal activities do not "jeopardize" the continued existence of threatened or endangered species and that the same agencies "insure" that federal activities do not "destroy" or "modify" habitat determined to be critical. Managers to this day are not sure exactly what all this means. Unfortunately, this grey area is now filled with all kinds of speculation and rumor.

In 1978, prompted by the Tellico Dam/snail darter issue, Congress modified the Endangered Species Act; now, before an area can be designated as critical, an economic analysis of the site must be done. This works well for a threatened or endangered animal in a relatively small area, but in the case of the grizzly, such a provision is impossible to comply with until the bear's

range is established, which may take years. Because of this situation, the USFWS formally withdrew its plans to designate critical habitat in the immediate future.

In 1979, the Endangered Species Act was reauthorized through 1982. Congress is debating another reauthorization right now. Without funding, efforts to delineate the grizzly's range and establish critical habitat may take decades and may never help the bear.

PROGRESS SINCE 1974

• 1974—Grizzly research was initiated along the East Front of the Rocky Mountains by the FS. Between 1976 and 1979, the effort was continued by the Border Grizzly Project. In 1980, the work was taken up by the Ecological Services Division of the DFWP under continued funding from the FS and the Bureau of Land Management, with added funding from the oil and gas industry. Biologist Keith Aune is now the principal researcher.

• 1975—The Yellowstone Interagency Grizzly Bear Team (YIGBT) and the Border Grizzly Project were established to study the Yellowstone Grizzly Bear Ecosystem and the Northern Continental Divide Grizzly Bear Ecosystem, respectively, and to gather information necessary to determine "critical habitat" as required by the Endangered Species Act. The YIGBT followed up on the pioneering work done by John and Frank Craighead in Yellowstone Park (1959-1970) and the Border Grizzly Project followed other work initiated in the Glacier Park area.

• July 1975—The Border Grizzly Project established a technical committee to train people and to enhance cooperation among the various researchers and managers in northwestern Montana. Subcommittees were created to handle local concerns along the East Front, in the Selkirk, Kootenai and Bitterroot ranges and in the Montana/Alberta border area. Dr. Jonkel is the coordinator.

• 1976—A Bear Specialist Group was formed within the International Union for Conservation of Nature to share bear information about six species, including the grizzly, that are found in 40 different countries sharing 70 languages.

• 1977—The Bear Biology Association was organized at the International Bear Conference conducted in Kalispell. This organization, a worldwide group of professional bear researchers and managers, was founded to facilitate the transmission of new research ideas and bear management techniques. Dr. Jonkel, director of the Border Grizzly Project, University of Montana, was the association's first president (1977-1980).

• 1978—John Craighead initiated grizzly research in the 239,296-acre Scapegoat Wilderness Area north of Lincoln.

• December 1979—After four years of effort, the "Guidelines for Management Involving Grizzly Bears in the Greater Yellowstone Area" was published. Editor Steven Mealey coordinated the findings of the Yellowstone Interagency Grizzly Bear Team, Yellowstone National Park, the USFWS, seven national forests and three state wildlife agencies into a single management document.

• July 1980—The DFWP modified its 1972 grizzly bear policy; the new policy was adopted by the Fish and Game Commission and codified under Section 12 of the Administrative Rules of Montana.

"...this past recreation season, 182 people lost their lives in our nation's national parks. Collectively, this loss of life did not have a tenth of the impact that three grizzly-caused deaths in Glacier Park had in 1980."

• February 1981—The Glacier View District of Flathead National Forest developed a precedent-setting document on the cumulative impacts of all kinds of individual developments on a forest district that is almost all grizzly bear habitat. Recently, the Kootenai National Forest staff completed a similar cumulative impact analysis of some 515,000 acres in the southern Cabinet Mountain Range, a grizzly area besieged by some 20 ongoing or proposed mines.

• May 1981—Glacier National Park released a new Bear Management Plan which contains policy, objectives and guidelines for the management of the park's 200-plus grizzlies. The plan calls for very close monitoring of grizzlies with stiff measures for bears that seem unusually interested in humans or populated areas. This plan was developed by Glacier Park bear authority Cliff Martinka and Chief Ranger Chuck Sigler.

• June 1981—The Tribal Council of the Confederated Salish and Kootenai Tribes of the Flathead Reservation formally adopted a Grizzly Bear Management Plan and required that the plan be implemented by the Tribal Fish and Game Conservation Department, Wildland Recreation Department and the Bureau of Indian Affairs Wildlife Branch. The plan was developed by researcher Chris Servheen and the Border Grizzly Project staff.

• June 1981—The Blackfeet Tribal Council and the Border Grizzly Project initiated grizzly research on the Blackfeet Reservation.

• September 1981—An interagency group involving all elements responsible for grizzly management in northwestern Montana developed a "Guideline for Determining Grizzly Bear Nuisance Status and for Controlling Nuisance Grizzly Bears in the Northern Continental Divide and Cabinet-Yaak Grizzly Bear Ecosystems." The USFWS, the federal agency with responsibility for grizzlies under the Endangered Species Act, also developed relocation plans for orphaned cubs, subadult females, adult females and subadult males on a case-by-case basis.

• January 1982—The Grizzly Bear Recovery Plan, in preparation for over three years, was signed by the director of the USFWS. This report brings together most of what is known about the grizzly's range in the continental United States and covers most of the management issues and coordination problems.

MONTANA GRIZZLY BEAR POLICY

As mentioned in the previous section, in 1980 the DFWP updated its grizzly bear policy and documented it in Section 12.9.103 of the Administrative Rules of Montana. In abbreviated form, it says:

• Montana is dedicated to the

preservation of grizzly bear populations and will work to promote and perpetuate the welfare of the bear for the enjoyment of the people of Montana and the nation.

- Since the grizzly bear occurs on wildlands that are mostly the responsibility of various federal agencies and private landowners, the Fish and Game Commission will enter into cooperative programs with these agencies and individuals to manage for the grizzly. Montana has a responsibility to carefully review and evaluate land use activities that may be detrimental to the grizzly.
- Research on the habitat requirements and population characteristics of the grizzly bear is essential for the welfare of the species and will be encouraged and supported by the state.
- Sport hunting is considered the most desirable method of balancing grizzly bear numbers with their available habitat, minimizing depredation against private property and minimizing grizzly attacks on humans.
- Grizzlies threatening or endangering human life shall be captured and dispatched immediately. Other problem situations not involving a threat to human life shall be evaluated on a case-by-case basis.
- Where removal of the bear is determined the best solution, the nuisance bear shall be trapped and if suitable for transplanting, it shall be marked, released and monitored as per agreement with the appropriate land management agencies. The state requires that the public must be informed of the transplant program and be given the reasons for capturing, as well as the location of the release area.
- Depredating grizzlies not suitable for release or research because of old age, acquired behavior, disease or crippling, shall be dispatched and sent to the state's research facility for investigation. When such action is taken, the reasons shall be fully explained to the public.
- The DFWP shall coordinate and consult with appropriate federal agencies and comply with all applicable federal rules, regulations and agreements.

WOULD YOU VOTE FOR THE GRIZZLY?

It would be interesting if on the next Montana ballot we could "vote" our feelings about the grizzly and indicate a position for or against expensive land management decisions to favor the bear's future. In northwestern Montana, people on both sides of the issue think they are in the majority.

At the national level, a study has been done to determine how Americans feel about wild and domestic animals. Stephen R. Kellert, a behavioral scientist at Yale University, wanted to find out how various groups in different areas of the country perceive animals. He distributed a questionnaire to a national cross section of people in an effort to document the range of human motives for involvement in animal-related activities. One of the questions he asked concerned the grizzly bear:

> It has been suggested that 5 million acres of National Forest Land be set aside so that the endangered grizzly bear remain undisturbed. The timber industry objects, saying jobs and needed lumber will be lost. Would you agree to protect the endangered grizzly bear even if it resulted in the loss of some jobs and building material?

	Strongly agree	Agree	Slightly agree	Slightly disagree	Disagree	Strongly disagree
Number of respondents	224	638	521	325	465	153
Percentage	9.1	26.0	21.2	13.2	19.0	6.3
(No response = 5%)		56%			39%	

A similar question about the bald eagle showed 89% favoring protection and 8% opposed, and a question about the mountain lion showed 73% favoring protection and 21% opposed.

In another question, Kellert asked 3,107 people selected randomly across the nation to indicate their interest in 33 animals, ranking them from 1 to 33. The bear (no distinction between black and grizzly) was ranked 18th, ahead of the wolf, coyote, shark, rattlesnake and rat, but behind the swan, robin, salmon, eagle, turtle, raccoon and moose.

What does this mean? I think in a poll in western Montana the grizzly would come out on top, but more than a few people would vote against the animal. There is, of course, a whole spectrum of opinion, ranging from those who do not even want the animals bothered by research to those who wish the grizzly was no longer in the state.

It is in this less-than-unanimous situation that political problems occur, and that decisions are deferred because there is no clear mandate.

SUMMARY

On the plus side, the Grizzly Bear Recovery Plan involved input from 28 agencies. Coordination among these groups is now better than at any time since the grizzly became a *cause célèbre* in the mid-1960s.

Researchers, administrators and politicians will never completely agree about the management of any wildlife species, since each group has a different legal charge and since they each have a little different perspective on what constitutes scientific fact, economic reality, popular (public) interest and practical action. Yet, the management of the grizzly is being formalized. Management plans, agreements of understanding and regularly scheduled coordination sessions are taking a lot of the guesswork and some of the personality conflicts out of handling the bears. While there is still room for improvement, the issue is handled better today than it has been in the past.

On the negative side, there is a growing gap between the public's philosophical commitment to endangered and threatened species and its willingness to foot the bill for these animals.

As budgets get tighter, there is a growing realization that the grizzly, unlike most other game animals, does not begin to cover its costs. Six hundred and sixty grizzly license buyers do not make much of a dent in what it costs the state to look after the bear. The sportsman pays the difference in higher license fees. Federal agency budgets do not reflect the strong congressional mandate to provide for the species either. Research operations like the Border Grizzly Project and the Yellowstone Interagency Grizzly Bear Team are

Seeing a grizzly or a fresh grizzly track is a thrilling, but somewhat unnerving, experience. It is the only North American land mammal indisputably able and occasionally inclined to threaten man (photo: Steve Gilbert).

literally and figuratively running out of gas.

The grizzly, of course, is not the only animal in the woods; bull and cutthroat trout in the North Fork of the Flathead, elk along the East Front, deer in the Swan, moose in the Yaak and myriad other wildlife species are also in need of closer monitoring. In focusing on the grizzly, other major wildlife-related issues—like the Northwest Power Act, the Land and Water Conservation Fund and the proliferation of forest roads—have gone almost unnoticed.

Can the grizzly be preserved? In the far reaches of Glacier and Yellowstone National parks and the remote areas of the Bob Marshall, Great Bear and Absaroka-Beartooth Wilderness areas, the bear should survive at existing population levels into the next century, if current management and protection efforts continue. But the roadless areas and wildlands that presently surround these legally protected islands of habitat are eroding. The intermittently occupied and potential grizzly habitat is being diminished by increasing development of all kinds. The bears are adaptable and are seemingly able to adjust to individual projects, but they eventually will fall to the cumulative impact of development and associated human activity. I do not see how one can project current trends and come up with more grizzlies in the future.

Perhaps more than anything, the potential for increased human/bear encounters clouds the grizzly's future. There simply is very little tolerance for life-threatening grizzlies, and no amount of argument, however factual, will change this situation. It is rooted in some civilizing imperative that goes beyond wildlife management. On this point, the bear cannot change and maybe man cannot change either. It is a fact that this recreation season, 182 people lost their lives in our nation's national parks. Collectively, this loss of life did not have a tenth of the impact that three grizzly-caused deaths in Glacier Park had in 1980.

Every wildlife manager is aware of this and a greater effort is being made each year to minimize human/bear encounters by better informing the public about the nature of the animal, by discouraging bears from coming into areas of human concentration, by increased monitoring of the bears and by more regulations and restrictions controlling human activity in grizzly country. Unfortunately, these efforts are in part canceled by the ever-increasing recreational use of the most remote areas of the bear's range.

It is the people/grizzly habitat ratio and human/bear encounter figure that most threaten the animal's future; hence, most proponents of the bear feel that the more country the bear is able to use, the better its chances for suvival in the lower 48 states. The problem is that there are competing uses for and other values of this land. To deny these other uses, to fail to take advantage of these other values, to manage continually and forcefully in the interest of the grizzly is a very costly proposition. Forgoing development—be it the logging of 200 million board feet of timber, the mining of a potentially rich silver or copper area, the opportunity to facilitate transportation or commerce—is expensive in terms of lost tax revenues, royalty payments, fiscal commitments, etc. The resultant cost/benefit figure involves all the values mentioned in the section on the grizzly as a symbol. With no clear popular mandate, with all the different land ownerships, jurisdictions and agency traditions and philosophies, it is no wonder the needed decisons are deferred. It is a politically volatile issue. Dedicated land use is the real solution when talking about the grizzly bear. Arguments about hunting, research, jurisdiction and management beg the issue and take the decision out of focus. Economic, social and political arguments are all short-term and will lose their meaning 50 years from now.

Can we increase grizzly habitat, increase the number of bears and perhaps even remove the species from the "threatened" list in the lower 48? We can, but there are limits. We need to define those limits while we still have some options. For certain, we cannot have more bears and what comes with them and continue to have more of what's working against them today.

In the world of wildlife, the grizzly shares the unfortunate fate of the African lion, Indian tiger, Nile crocodile, the leopard and the cheetah—natural hunters whose way of life is seemingly incompatible with what is perceived today as wise and necessary.■

The "Magic" Cows

by Joe Egan

ALL LIFE on this planet depends on the sun. Much of the solar energy radiated to earth is reflected back into space by the earth's atmosphere and the comparatively small amount that reaches the earth's surface provides us with all the energy we have. Most people know these things.

Many people also know most of this solar energy ultimately is made available to us via plants, that plants are supported by soil, and that the interaction between solar energy, the soil and the plants involves water, minerals and climate. Without soil and plants, all life on this planet would simply perish. Everybody knows this, and we could expect that humans would do all they could to maintain healthy plant communities and soil conditions.

But such is not the case. W.C. Lowdermilk's "Conquest of the Land Through Seven Thousand Years" describes how soil fertility in the Near East, Greece and North Africa was virtually destroyed because man did not maintain the plant communities and soil. You may be thinking: Those areas are far away, and the problem happened years ago. You may be thinking that in North America, and the United States in particular, we really don't have that problem; *we* don't let sheep or goats or horses or cows abuse the plant communities to the extent soil is washed into the sea. Think again! When the United States was largely wilderness in the 1700s, topsoil was generally about nine inches deep. Today—less than 300 years later—the topsoil averages about six inches deep, a loss of one-third.

In his booklet, "Principles of Rest-Rotation Grazing and Multiple-Use Land Management" (1970), A.L. Hormay wrote, as have others, that much of our western range (Montana's included) has been abused in the past hundred years and the productivity of these lands reduced. Heavy stocking and long seasons of use by livestock year after year have been the major causes of the deterioration.

The livestock industry has received some pretty severe criticism because of the damage livestock have caused to the western ranges. Unfortunately, in some cases the criticism has been justified. Some operators and agencies have allowed livestock to damage both private and public ranges. The damage came not so much from too many cows nor from heavy use at infrequent intervals, but from substantial numbers of livestock using the same areas year after year. This continuous grazing does not allow the plants to recoup or rebuild their energy stores. Over time, the plants simply weaken and die. Of course, the first to go are the more desirable plants—the ones livestock like to eat. With continuous grazing, all plants are ultimately deprived of rest and most die out, except the most unpalatable ones.

Big game animals have, on occasion, deteriorated their own ranges. Continuous grazing or browsing of the same plants in the same area year after year has sometimes caused primary wildlife food supplies to deteriorate. In many cases, the passing of the primary food supplies simply meant these animals were forced to eat less palatable and less nutritious vegetation. When the food supplies collapsed, so did the big game populations in that area.

In some parts of Montana, the mining and logging industries have been responsible for deterioration of vegetation and soil.

Because humans tend to avoid taking blame for their shortcomings, range deterioration is often blamed on the weather. It is convenient to overlook the fact that soil formation and development of plant communities is a *result* of the interaction with climatic conditions. Like wet years, periods of drought *do* occur. The plants that live in a given area are there because of the climate, not in spite of it. In the case of livestock grazing, a cold, hard fact of life is that people failed to remember that plants also need rest.

Under rest-rotation grazing management, all plants—forbs, grasses, shrubs and trees—are provided opportunity to grow and reproduce (DFWP photo: Dick Ellis).

Plants, including those that developed on our western ranges, are equipped to accommodate use by grazing animals. We must remember that plants make their own food utilizing the sun's energy, that this process occurs when the plant is *green* and that it occurs in the leaves. If livestock overgraze these plants year after year during that green period, the all-important food-making green parts of the plant will be systematically eliminated. The plant's ability to make and store food and energy will slowly, but surely, be reduced and finally eliminated. The plant then dies.

Ranges deteriorate because plants die. With loss of plants, soil-building and maintenance processes are altered and soil erosion or loss begins. Soil is renewable because conditions for its formation are always present, but soil formation may take hundreds, if not thousands, of years. Because soil is the basic land resource, it must be protected at all cost.

In his booklet, Hormay described effects of past and present grazing practices which did not consider plants' need for rest:

> The idea has long prevailed that overstocking is the main cause of range deterioration. This thought has been expressed as follows: "White man allowed too many of his grazing animals to use the range. He overstocked the range almost from the start. How else explain the depletion of the range by more than half?" ("The Western Range," 1936)
>
> This belief has led to a conviction that range improvement depends principally on regulation of stocking rate and that proper use of the vegetation can be obtained through proper stocking. This proper-use philosophy of management is more widely accepted today than any other and is the basis of management on most ranges.
>
> However, assumption that plants can be grazed to a proper level through regulation of stocking is unrealistic because of the grazing habits of livestock. Livestock graze the range selectively, by species and areas. They consistently graze the more palatable plants and accessible areas closely and, invariably, beyond proper-use level. The pattern of use is very uneven, but much the same from year to year. Plants grazed closely one year tend to be grazed closely the next. So under continuous grazing at any stocking level, the more palatable and accessible plants are gradually killed out. Livestock then graze on less desirable plants. This process leads progressively to ever enlarging areas of deterioration. Unfortunately, the best plants and best grazing sites are destroyed first.
>
> Destruction of the better plants and sites is accepted as inevitable under proper-use management: "Just as there are certain sacrifice areas, there are also some sacrifice plants—species with high animal preference but never abundant in the stand. These 'dessert' or 'ice cream' plants are usually killed out when the hardier, more abundant, and somewhat less highly preferred key species are properly utilized, a fact that entails little economic loss." (Sampson, 1952)
>
> The question may be asked: After the ice cream plants are destroyed, what is sacrificed next? Clearly, the degree of use on individual plants cannot be regulated.

In 1948, while he was a range scientist with the U.S. Forest Service, Hormay developed a method of periodically resting the range from use. The system, commonly called rest-rotation, was first applied in 1952 on the Harvey Valley cattle allotment on the Lassen National Forest in California. Since, many systems have been implemented on ranges, mainly on public lands throughout the West (including Montana), but most were improperly designed or improperly applied and many were abandoned after a short period of use. Results have left much to be desired and have given rest-rotation grazing a bad name.

Rest-rotation consists essentially of dividing the range into pastures, with each pasture being systematically grazed by livestock and then rested.

According to Hormay:

> A pasture or unit of range is rested from use after a season of grazing to: (1) allow plants opportunity to make and store food—to recover vigor, (2) allow seed to ripen, (3) allow seedlings to become established and (4) allow litter to accumulate between plants.
>
> The amount of rest needed depends on the plants involved, character of the range, ... objectives of management, [and is] determined for each range individually.
>
> [About] two years of rest are adequate to restore plant vigor.
>
> Seed-ripe date is determined by the species of plant that ripens seed latest in the season.
>
> More than one year's rest is usually needed for establishment of seedlings. The key condition is that seedlings are large enough to withstand appreciable grazing and trampling. Usually this stage is reached after two seasons of root growth.
>
> Accumulation of plant litter between plants is important in controlling soil erosion and improving soil fertility. Adequate litter usually accumulates during the rest periods provided for restoration of plant vigor and establishment of seedlings.

Hormay refers to the sequence of grazing and resting as the "grazing formula." A "Five-Treatment Grazing Formula" is illustrated in Figure 1.

Hormay described it as follows:

> [Figure 1] shows the order in which the planned grazing and resting treatments are applied in a pasture over time. The anticipated end results of such a sequence or cycle of treatments are high plant vigor, more plants and more litter. Grazing after seed-ripe time in treatment C is very important in getting seedlings established because of trampling of seed into the soil. Seeds trampled in the soil, if only to a shallow depth, have a much better chance of germinating and establishing as seedlings than seeds that lodge on the soil surface, especially on eroded sites. The seeds should be trampled as soon as possible after falling so as to minimize loss to rodents, insects and birds.
>
> The sequence of treatments is repeated until the range is adequately vegetated. Then the range may again be grazed until the need for resting is again apparent. A certain amount of rest is always needed to maintain plant vigor.
>
> The number of treatments in a formula depends on the amount of rest needed at various times. The number may be two or more but rarely exceeds eight. . . .The three treatments—A, C and D in the five-treatment formula illustrated—provide adequately for plant vigor, seed production, seedling establishment and litter in many cases. But all these results cannot be realized with less than three treatments. . . .
>
> The range manager must prepare the formula to fit his specific range. The results obtained are determined by the formula. So grazing management is as effective as the manager makes it.
>
> A pasture is needed for each treatment in the grazing formula. The number of pastures, therefore, is the same as the number of treatments.

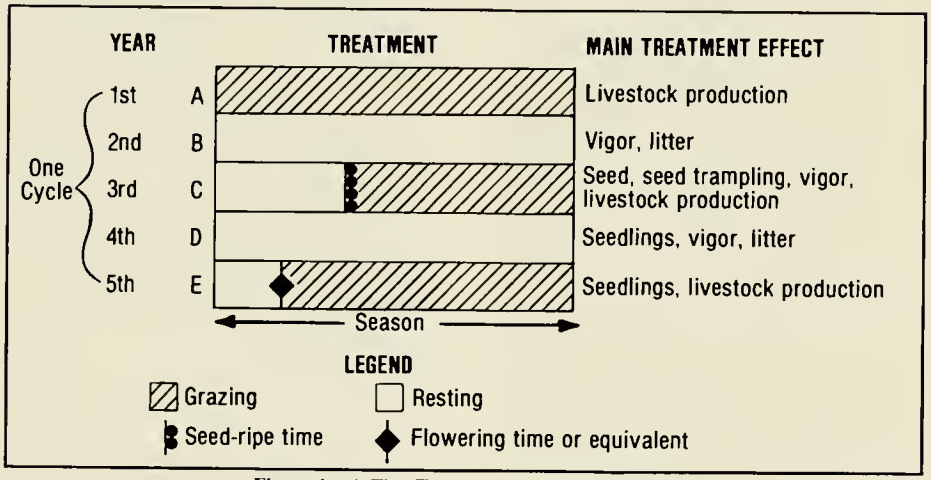


Figure 1—A Five-Treatment Grazing Formula

YEAR	PASTURES 1	2	3	4	5
	TREATMENTS				
1	A	B	C	D	E
2	B	C	D	E	A
3	C	D	E	A	B
4	D	E	A	B	C
5	E	A	B	C	D
6	A	B	C	D	E
7	B	C	D	E	A
8	C	D	E	A	B
9	D	E	A	B	C
10	E	A	B	C	D

Figure 2—A Grazing Schedule for a Five-Treatment Formula for 10 Years

Figure 2 illustrates a grazing schedule for a five-treatment formula for a 10-year period.

Pastures should be about equal in grazing capacity, with stocking rates based on forage produced in the pastures to be grazed. Each pasture should have about the same amount of low and high elevation areas. Any treatment can be applied to any pasture the first year but must follow the sequence thereafter.

In well-designed formulas, the amount of rest area is between 20% and 40% each year, but more may be rested to provide for special situations. Adequacy of stocking is best determined by performance of the livestock (weight gains) and trend in the condition of the range. Although the range may be grazed at any time of the year, it is desirable to have livestock on the range at seed-ripe time to trample (plant) seed. Proper stocking rate is arrived at gradually and may take three, four or more years to determine.

In rest-rotation grazing, any kind or combination of livestock can be used that can be supported by the vegetation. Most efficient use of forage is accomplished when more than one kind of animal grazes the area. A rest-rotation grazing system is designed and unique for each range. The system is also fashioned objectively to meet plant growth requirements and management objectives for each range. The effectiveness of each system depends entirely on the range manager.

In wildlife circles, there are many misconceptions about rest-rotation grazing:

(1) It is designed primarily to produce grass and livestock.

(2) It is detrimental to the growth of forbs, shrubs and trees important to wildlife.

(3) It calls for heavy grazing in some pastures.

(4) It deteriorates riparian (streamside) habitat.

(5) It calls for spraying, chaining and artificial seeding.

None of these is true.

The sole purpose of a rest-rotation grazing system is to promote and maintain the growth of vegetation on the range. It is designed to accomplish this and thus maintain the basis of renewable resources and land productivity. It is not aimed at

continued on page 22

The Catchall

Questions and Answers about the Big Game Drawings

Each year, the Department of Fish, Wildlife and Parks conducts drawings to select names of persons who will receive special deer and elk permits and the following licenses: deer B, nonresident deer A, antelope, moose, sheep and goat. From time to time, the Special License Section receives questions about procedures used in the drawings. Some of these questions are of general interest and we would like to share this information with sportsmen.

* * * * *

Q: In the past, I always seemed to draw more licenses. It has now been three years since I drew one. Why?

A: Two things influence the success rate of applicants in the drawings: (1) the number of licenses issued and (2) the number of people who apply.

To follow success rates, it is necessary to look at each species individually.

The number of antelope applicants has remained fairly constant over the last 10 years. The number of licenses issued has fluctuated, depending on the numbers of antelope available. Around 1978, antelope populations dropped substantially, causing a reduction in the number of available licenses. The antelope population appears to be recovering and more permits are once again being issued.

Interest in special elk permits has increased dramatically in the last five years. In 1976, approximately 25,000 hunters applied for elk permits; by 1981, this figure had risen to over 50,000. The success rate in the elk drawings is now fairly low in many districts. In several districts, the probability of drawing a permit is now well under 10%.

In the moose, sheep and goat drawings, the number of applicants has increased in a slow but steady trend for the last 10 years. Interest in these licenses is so intense, compared with the number of permits available, that drawing a permit in any district is difficult.

Q: We apply for the drawings by the June 15 deadline, yet the drawings are not conducted until late August. Why does this take so long?

A: In 1981, the Special License Section received over 85,000 applications for the drawings. Each one of these has to be opened and checked and the money counted and balanced. In addition, applicants who enter as a party must be matched and applications which have mistakes must be processed. When the processing is completed, information about all applicants must be entered into the computer.

Because of the number of applications received, this process takes about two months.

During August, the Fish and Game Commission meets to set the final harvest quotas based on the latest game information. As soon as the quotas are finalized, they are entered into the computer and the drawings are conducted.

The actual drawings are accomplished relatively quickly. The majority of our time is spent entering the applicants' data into the computer.

Q: Why was my application rejected from the drawings?

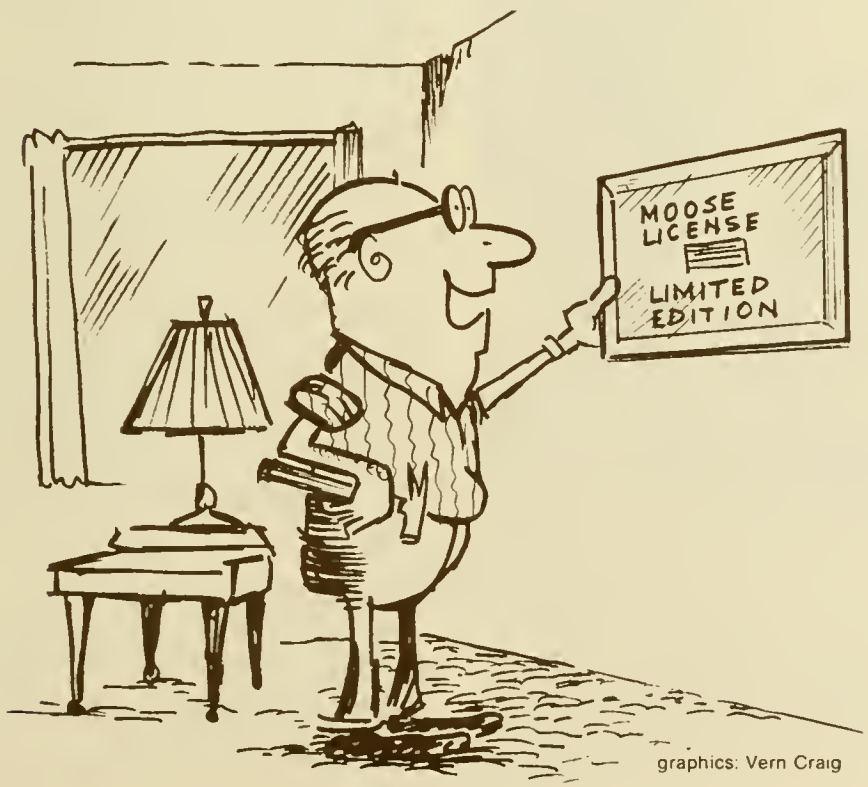
A: There are a variety of reasons, and the following are the most common:

1. *The applicant fails to supply the required information at the top of the application.* Five items are required on the resident application—(1) name and address, (2) date of birth, (3) conservation license number, (4) hunter safety number, if applicable, and (5) signature. These items are either required by law or are essential in order to mail a license to the applicant.

2. *Money problems.* The applicant either forgets to include money or miscalculates and submits less than the required amount. Applications are also submitted with checks which do not clear the bank.

3. *Applications too late.* Applications must be postmarked by June 15; applications postmarked after this date cannot be accepted.

In addition to these most common errors, some applications contain mistakes which prevent the application from being entered in the drawing for a single species. This kind of mistake usually results from an applicant misreading a district number. For example, the hunter could be picking a deer area while looking at an antelope map. However, if a hunter uses an incorrect district number for one species, he will still be entered in the drawings for any



graphics: Vern Craig

other species for which he applied.

Q: I know of a man and his wife who both received a sheep permit in the same district. How does this happen?

A: Success generally averages less than 5% in moose, sheep and goat drawings. In a purely random drawing, it would be somewhat rare for members of the same family to be successful.

However, the preference system has made this much more likely. When the system was begun in 1973, many family groups applied at the same time and in the same district. They have continued to apply each year and have acquired numerous years of preference. If, for example, the family members have eight years of preference and they all apply in the same district, it is very likely that several of their names will be drawn.

The preference system is now being phased out and the 1983 hunting season is the last season for which preference may be applied. After that, all applicants will be drawn randomly. This will substantially reduce the chance of successful applicants coming from the same family.

Q: I had landowner's preference in the last drawing. Why didn't I receive a permit?

A: Landowner preference simply means that qualified landowners will receive up to 15% of the deer and antelope permits or licenses for a district.

For example, if there are 100 available antelope licenses in a district, 15 will be available to holders of landowner preference. If 18 landowners apply, only 15 of them will be selected. The three who are unsuccessful will then be entered in the regular drawing for that district along with the other applicants. They will, therefore, have a second chance to draw a permit. In recent years, increased hunter interest and reduced license numbers in some districts have combined to produce more unsuccessful landowner applicants.

Q: What are my chances of success in the various drawings?

A: Generalizing about the probability of drawing a license for a species is difficult, since the probability varies widely from district to district. In some special elk districts, the probability of drawing a permit is about 2%; in others, everybody who applies for the district as a first choice receives a permit.

Statewide in 1981, more deer B licenses were available than there were applicants. This gave a probability for success of 100%. However, in many popular districts, there were many more applicants than licenses and thus many applicants were unsuccessful.

Even with these shortcomings, it is possible to obtain a general picture of the chance for success by looking at statewide results. The following chart has been prepared from results of the 1981 drawings for resident licenses:

This table was based on 1981 information. In future years, both the number of licenses offered in each district and the number of persons applying will vary.—*Tere Hassett, supervisor, Special Licensing; Jim Heck, supervisor, Warden Program*

1981 DRAWINGS FOR RESIDENT LICENSES

Species	Number of licenses or permits issued	Number of applicants	% probability of drawing
Antelope	22,195	34,498	64%
Deer B	11,415	10,978	100%
Special deer	4,750	5,409	87%
Special elk	12,450	43,021	28%
Sheep	203	5,615	3%
Goat	364	5,575	6%
Moose	532	16,586	3%

Cedar Creek Fish Ladder

For the first time in 12 years, Yellowstone cutthroat trout have returned to traditional spawning areas in Cedar Creek, a tributary of the upper Yellowstone River.

The return is made possible by a special fish ladder designed to help the trout pass through a culvert beneath U.S. Highway 89 near Corwin Springs. The ladder was designed and installed by Dr. Don Reichmuth, a civil engineer from Montana State University in Bozeman. It was paid for by special funds from the Montana Department of Fish, Wildlife and Parks.

The need for the ladder became apparent when in 1969, the Montana Department of Highways replaced a bridge across Cedar Creek with two 150-foot long culverts. Cutthroat trout entering Cedar Creek to spawn were unable to swim through the culverts because of the swift, unbroken water flow, so they became cut off from a large section of their traditional spawning area.

Fish continued to spawn between the river and the culvert but spawning success dropped as fish competed for space. Successive pairs of cutthroats would spawn in the same place; in building their nests (or redds) the eggs that had been deposited earlier were destroyed.

The idea behind the fish ladder was to create small pools or pockets inside the culvert so that trout could rest as they moved upstream through it. The ladder posed a special engineering problem because the Department of Highways specified that the ladder not catch debris and that it be removable in case debris was caught.

Dr. Reichmuth solved this problem and, with Department of Highways approval, the ladder was installed in April 1981. Once the ladder was in place, water velocity in the culvert decreased by about two-thirds. The true test, however, would be how the ladder withstood spring runoff and whether trout would use it.

A fish shocking survey during the spawning season found that cutthroats had indeed used the ladder and once again were spawning in the creek above the culverts. Since adult cutthroat trout return to spawn in the stream where they hatched, production of trout in this stream should increase.

Yellowstone cutthroat trout are classified as a "species of special concern" by the DFWP. They are found only in the Yellowstone drainage and are vulnerable to man's activities. The use of tributaries as spawning areas has been documented; however, many of these streams dry up in late summer because of irrigation demands and the eggs and trout fry die. Protection of the limited spawning area in the Yellowstone drainage is extremely important to the future of these fish. The Cedar Creek ladder has improved this situation by providing another foothold for the Yellowstone cutthroat trout in its struggle to survive.—*Chris Cauble, Livingston Enterprise; Chris Clancy, fisheries biologist, Department of Fish, Wildlife and Parks, Livingston.*

BLM's Missouri Maps

There seems to be some confusion concerning the charges quoted in the March/April 1982 *Montana Outdoors* article, "Attention Floaters" in "The Catchall" section.

Please note that the Bureau of

Land Management's Upper Missouri National Wild and Scenic River Floater's Guide comprises four maps in two sets: Maps #1 and # sell for $1.50; maps #3 and #4 sell for $1.50, or $3 for the entire set.—*Carl Lind, river manager, Bureau of Land Management, Lewistown District, Airport Road; Lewistown, MT 59457*

Bicycling—the Way to Go

In celebration of the over 105 million bicyclists in the United States, May has been designated American Bike Month. This year's theme is "Bicycling—the Way to Go." Gov. Ted Schwinden has initiated Montana's commemoration by also proclaiming May as Montana Bike Month.

Bicycling has been part of Montana's history for nearly 100 years. As early as 1895, a bicycle rental agency was operating in Missoula. The following year, a bicycle corps was formed as part of the 25th Infantry stationed at Fort Missoula. This corps tested use of bicycles in the military by riding the 1,900 miles from Missoula to St. Louis. In the early 1900s, bicycles were one of the only means of transportation through Yellowstone National Park.

Recently, Montana has been the home for many innovative bicycling trends and programs. "Bikecentennial," a national touring organization headquartered in Missoula, initiated and promoted a transcontinental bike trip to celebrate America's bicentennial in 1976. The group is currently responsible for establishing major bicycle touring routes across the United States, mapping the routes, providing information and leading tours.

An effective bicycling education program was developed through the Montana Office of Public Instruction. The program receives national attention and is often used as a resource in other bicycling programs.

Every spring, more and more bicyclists pedal down the streets. They are bicycling to conserve energy, save money, improve their health—and to have fun. Numerous bicycling activities are scheduled for May around the state and nearly every city and town in Montana has a bike club which sponsors rides, races and clinics for bicyclists of every riding ability and interest. For additional information about specific bicycling events scheduled during May in Montana, contact: Sue Lindgren, Bicycle/Pedestrian Program, Office of Public Instruction, State Capitol; Helena, MT 59620 (406/449-3126).

Peregrine Article Available

Montana's peregrine falcon recovery program has been featured in a recent issue of *Exxon USA* magazine, published by the Exxon Co. Exxon furnished a portion of the funds used in the Department of Fish, Wildlife and Parks peregrine recovery efforts in 1981, and will also participate in the 1982 efforts (see *Montana Outdoors*, Jan./Feb. 1982).

Free copies of the First Quarter 1982 issue of *Exxon USA* are available by sending a postcard to: Barbara Johnson, Public Relations, Exxon Co. USA, P.O. Box 2180; Houston, TX 77001. Be sure to include your name and address on all requests, and specify the issued wanted.—*Dennis Flath, nongame biologist, Bozeman*

Vince Yannone is full of surprises. But the tables were turned on him during a "Day With Vince and His Critters" at Ophir School in Gallatin Gateway. The school has an enrollment of 32 in Kindergarten through Grade 8. In his official role as the department's youth educator, Vince was expounding on the characteristics of grizzly bears—long claws, silver-tipped fur, hump on the back—while attired in nothing less than an honest-to-goodness grizzly hide. Soon after, Jody Alverson stepped forward and presented Vince a check for $140.50, plus $10 in cash, for "helping orphaned and wounded animals, or buying stuffed mounts for other kids to see." The funds for the surprise presentation came from proceeds of a wildlife slide show. Parents Donna Kesler and Paulette Hill assisted in the fund-raising efforts (photo: Greg Hamley, Ophir School).

1981 Fishing Records Summary

Two Montana fishing records were broken in 1981—lake whitefish and white sucker—and the carp was added to the "Fishing Records Summary." The marks for lake whitefish and white sucker had stood since 1978 and both new records were taken from the same locations as the previous records.

To be included on the state records list, we require that the fish (1) be legally harvested, (2) be weighed on an inspected scale (most grocery store scales are certified and inspected) and (3) be positively identified. To maintain the list's integrity and to protect current record holders, we ask that a record fish be documented and verified by department personnel *whenever possible.* If a department employee is unavailable, the angler must present a photograph from which the fish can be properly identified; however, identification by photograph is difficult with some species. If the fish is not weighed by department personnel, the angler must also present an affidavit from the store where it was weighed.

Species	Weight lbs.	Weight ozs.	Angler	Year	Location
Bigmouth buffalo	32	6	Gary Lundman	1979	Missouri River (Slippery Ann Game Station)
Black bullhead	1	11	Mike Mitchell	1977	Horse Creek (McCone Co.)
Black crappie	3	2	Al Elser	1973	Tongue River Reservoir
Bluegill	2	8	George Schlosser	1967	Dengel Reservoir
Brook trout	9	1	John R. Cook	1940	Lower Two Medicine Lake
Brown trout	29	0	E. H. "Peck" Bacon	1966	Wade Lake
Burbot (ling)	13	4	Paul Keller, Ernie Schutt	1980	Missouri River (below Fort Peck Dam)
Carp	31	8	Buster Barbee	1980	Petrolia Reservoir
Channel catfish	23	4	Larry Hamilton	1980	Milk River
Coho salmon	4	14	Irven Stohl	1973	Fort Peck Reservoir
Cutthroat trout	16	0	William D. Sands	1955	Red Eagle Lake
Dolly Varden	25	10	James Hyer	1916	Unknown
Drum	13	6	George Gallagher	1973	Fort Peck Reservoir
Golden trout	2	9	Raymond D. Gallik	1975	Lightning Lake
Goldeye	2	9	Lester Estenson	1977	Nelson Reservoir
Grayling	2	10	Mark Daniels	1974	Handkerchief Lake
King salmon (chinook)	4	7	Berry Gillis	1972	Missouri River
Kokanee salmon	5	15	Forrest Johnson	1976	Pishkun Reservoir
Lake trout	42	0	Dave Larson	1979	Flathead Lake (east shore)
Lake whitefish*	**5**	**8**	**James Sellen**	**1981**	**Echo Lake**
Largemouth bass	7	8	Bruce Blahnik	1980	Kicking Horse Reservoir
Mountain whitefish	4	9¾	Mike Hangas	1977	Blackfoot River
Northern pike	37	8	Lance Moyler	1972	Tongue River Reservoir
Paddlefish	142	8	Larry Branstetter	1973	Missouri River
Pallid sturgeon	60	0	Gene Sattler	1979	Yellowstone River
Rainbow trout	20	0	C. J. Brohaugh	1952	Cliff Lake
Rainbow-cutthroat hybrid	17	10	R. A. Rousselle	1973	Ashley Lake
Sauger	7	2	Raymond V. Johnston	1975	Tongue River Reservoir
Shortnose gar	3	1	John Johnson	1977	Fort Peck Dredge Cuts
Shovelnose sturgeon	12	12	Troy Sidewell	1978	Marias River at Loma
Smallmouth bass	4	11½	Bob Higson	1975	Horseshoe Lake
Smallmouth buffalo	9	4	Mac McKinney	1977	Hauser Lake (west side)
Squawfish	6	10	Rick Norris	1979	Flathead Lake (Polson Bridge)
Walleye	14	0	Neil Berg	1974	Nelson Reservoir
White crappie	2	2	Drew Jackson	1978	Tongue River Reservoir
White sturgeon	96	0	Herb Stout	1968	Kootenai River
White sucker*	**4**	**5**	**Fred Perry**	**1981**	**Nelson Reservoir**
Yellow perch	2	0	Gerald Pottratz	1974	Nelson Reservoir

***New Montana records for 1981**

photo: Bill McRae

Montana's Mysterious Cat

by Kerry Murphy and Bart O'Gara

THE mountain lion, also known as the cougar, panther, puma, and catamount, is a large, secretive carnivore that thrives in sparsely settled country from northern British Columbia to southern Argentina. Although the species has been extirpated or is rare in most of eastern North America, it is common in suitable habitat of the Rocky Mountain and Pacific states and parts of Texas. South American subspecies have been largely eradicated from the more densely settled areas; however, the animal has fared better there than in North America.

The mountain lion is adapted to a broad range of environments: swamps, grasslands and brushy deserts, as well as tropical, deciduous, and coniferous forests. Its habitat ranges from sea level in many areas to about 15,000 feet in the Andes of South America. Lions do not require wilderness country as many people believe, and often live surprisingly close to human developments, especially those in or near big game winter ranges.

Mountain lions are fairly common in western Montana and have been reported in the Missouri River breaks and other parts of eastern Montana during the last five years. Yet, most outdoorsmen have never seen one unless it was treed by dogs. No

wonder this cat is often described as shy, secretive, elusive, wary, or mysterious. Part of the reason people do not see lions is that the cats are somewhat nocturnal—but then, so are the regularly seen deer and elk the lions prey upon. Obviously, lions are masters at skulking about unseen, which really shouldn't surprise anyone, since that is how they make their livings. These cats are fast in a short sprint, but are unable to outrun most of their prey over any great distance. Thus, the lion moves slowly, takes advantage of screening cover, makes practically no noise, and has infinite patience—all characteristics that many two-legged hunters never learn.

The mountain lion lacks the colorful stripes and spots possessed by some of the world's great cats, and the awesome bulk of others. However, they're still sizeable; those in Montana stand from two to two and one-half feet high at the shoulder and slightly higher at the hips. Males are about seven feet from the tip of nose to tip of tail and females about six feet. Weights of adult females range between 70 and 120 pounds and fluctuate with demands of raising young; males weigh in at a hefty 150 to 190 pounds after reaching adulthood. Stomach contents may vary in weight from zero to 30 pounds, accounting for some of the variation.

The fur of Montana lions is somewhat coarse, with a predominance of guard hairs. Consequently, the pelts have little commercial fur value, as opposed to the bobcat and lynx. Coloration in lions varies considerably, ranging from reddish to slate grey; tawny is the most common color we have encountered. Melanistic (black) lions have been reported. Colors are usually deepest along the back, and whitish shades always occur on the underside. Kittens are similarly colored but spotted until nearly half grown.

A lion's head is small and appears rounded with a very short face. Like all members of the cat family, the lion has teeth designed to shear food—adaptations for a meat diet. Four large canine teeth are used in threatening displays and are important tools for killing. Eyes are large and placed downward on the head for sight hunting. The ears are short and rounded, but the rest of the body is long and lithe. The shoulders and legs are highly muscular, and when combined with this cat's long hind limbs, provide tremendous power for leaping.

Until 1962, Montana's mountain lions had a $50 bounty on their heads. This photo was taken in Helmville, Mont., in about 1952 by Tom Edwards (courtesy of Howard and Wendell Copenhaver).

Lions often perform amazing acrobatic feats when treed or pursued by hounds. They commonly jump into and between trees, and show considerable agility when climbing. We have seen lions jump to the ground from as high as 30 or 40 feet with no apparent injury. Such displays are impressive reminders of this species' tremendous physical abilities—abilities honed by the forces of natural selection over thousands of generations of existence in an unforgiving environment.

Mountain lions are opportunistic hunters, taking almost any size of prey, from grasshoppers to young moose. Deer and elk provide the bulk of their diet in western and central Montana, but small mammals provide an important food source during nonwinter months. Porcupines are often taken. Most of the lion carcasses we autopsy have at least a few quills under the skin of the forearms. Quills found in the stomach or intestines are as limber as cooked noodles and apparently pass through the entire gastrointestinal tract without harming the lion.

Lions are solitary hunters, except when females are accompanied by males or kittens. Young siblings may also travel together for a short time after family breakup. Females use a cave or other den temporarily when kittens are small, frequently moving them to kill sites to feed, then returning them to the den while more food is procured. The female may leave her kittens alone up to two days, during which time they are vulnerable to other predators, including adult male lions. After the kittens reach about 20 pounds, they begin traveling with their mother, learning the lessons of the hunt required for survival as an adult. The few reports of problem lions we receive each year usually turn out to be young lions that apparently were ineffective hunters or were injured in an encounter with prey. These cats tend to wander into settled areas where the lure of an easy meal outweighs their natural fear of man. Such individuals probably didn't learn their lessons well.

Lion kills are suspected whenever a deer or elk carcass is found with snow or vegetation raked over it.

Small prey and even deer are often carried or dragged for considerable distances after they are killed. When little material is available to cover a carcass, the hair is scratched loose and covers the animal like a fluffy blanket. Bobcats also scratch up deer hair on their kills, and bears will bury carcasses, but they use more dirt and larger sticks than lions do. To be sure a carcass represents a lion kill, available evidence must be investigated carefully. Lions usually eat what they kill, but we have found and received reports of coyotes and mountain sheep killed and left. Perhaps, those lions were full and happened on to an easy kill.

A large number of authors have stated that lions kill large animals by a blow or wrench with a paw to break the neck, or by choking the prey with a throat hold. The large prey we have looked at in Montana were killed by a powerful bite into the top of the neck just behind the skull. Such bites disjointed the vertebrae of the upper neck, resulting in sudden death. Lion victims usually have claw marks, most easily seen after skinning, in their sides and backs.

When tracking snow is available, backtracking from a carcass is always informative. Death is sometimes quick where the cat made its catch, but sometimes the lion rides its prey for 100 yards or more. The larger the prey, the greater the chance a lion will be carried for some distance. Hair and small strips of hide are often found beside the tracks of a running ungulate carrying a lion. Apparently the cat does a lot of clawing as it struggles to gain a killing hold.

Our experience indicates that any deer or elk in a position where a lion can quietly stalk it may become a meal. Maurice Hornocker conducted a landmark research effort on a lightly hunted lion population and its effects on large prey in the Idaho Primitive Area. He found that physical condition of the prey was not a factor in determining the incidence of lion kills on either deer or elk. However, he noted one instance of a 150-pound male lion passing up three six-point elk that he had stalked to within attacking distance. The lion then retreated, circled the three bulls, and killed a yearling bull within 150 yards of the others. Hornocker postulated that the size of the mature bulls may have been a deterrent or that lions may fear the antlers. He pointed out that some cow elk reach the size of the younger prime bulls, yet cows appeared to be taken indiscriminately. A lion may recognize heavy antlers as formidable weapons and only take animals carrying them when it is extremely hungry.

Many lions are probably killed or wounded by large prey. Several authors have reported finding deer and lion carcasses together, suggesting that the cat was killed during its attack. Houndsmen sometimes encounter lions with missing canines, eye injuries, or puncture wounds. One hunter brought us the head of a cow elk he had shot; embedded in the base of the skull was the entire canine tooth from a lion. The elk appeared healthy when it was shot, but the lion's ability to obtain food was probably decreased substantially.

Although mountain lions are occasionally hurt by their prey, they are probably the most efficient killers of all the world's great cats. A mountain lion that kills a mature bull elk conquers a very tough animal about five times its own weight. African lions seldom kill prey more than three times their own weight, and they usually attack in prides or at least pairs. Tigers generally hunt alone, but they outweigh much of their game. Leopards and jaguars are about the same size as mountain lions, but their prey is seldom larger than deer. Despite its tremendous predatory abilities, the mountain lion is a surprisingly mild animal when treed by dogs; even a small yapping poodle can tree the largest tom! The cat will often respond with intimidating snarls and extended claws, but threats are seldom fulfilled.

Although the leopard has killed and mauled hundreds of people, mountain lions in the wild usually avoid people. The few instances of these cats attacking humans have invariably involved malnourished young lions or injured adults. Human victims are usually children.

In contrast to ranchers in many other western states, Montana livestock owners have few problems with lions. Usually only a single individual is the offender; the majority of the population remains true to natural prey. The few complaints each year in Montana are usually handled by local houndsmen cooperating with wildlife enforcement officials. The offending cat may be shot and killed, or tranquilized and transported to other areas where it is less likely to encounter domestic livestock. States such as Arizona, New Mexico, and Colorado generally experience more problems, and losses to lions can be important factors in the economies of local livestock operations. Often, many individuals are habitual offenders, and reducing or eliminating livestock losses without greatly reducing lion populations is difficult.

With settlement of the West, mountain lions, like all large carnivores, were considered competitors, hazardous to man's interests and economies. They were pursued and killed indiscriminately, and bounties of up to $50 per hide were paid in Montana until 1962. After the 1960s, the ecological and potential economic value of mountain lions became recognized. Most western state legislatures, including Montana's, moved to protect these animals by elevating their legal status.

In 1971, the mountain lion became a legal game and trophy animal in Montana. To game biologists and managers, the lion and the houndsman represented additional responsibilities. Information was needed concerning this cat and the small group of men who had been pursuing it long before it gained legal protection.

The Montana Department of Fish, Wildlife and Parks, the Cooperative Wildlife Research Unit at the University of Montana, and a group of volunteer western and central Montana houndsmen foresaw the need for comprehensive management information concerning mountain lions and initiated a capture-mark-recapture program aimed at obtaining biological information. The department and unit provided the necessary equipment for immobilizing the big cats, and the houndsmen eagerly moved into the difficult task of capturing and marking lions. Although a large

number were marked, after several years it became clear that information was accumulating too slowly. In 1979, a more intensive investigation (still in progress) was launched concerning fundamental aspects of lion ecology, and the impacts of hunting. Lions are captured by using trailing hounds and tranquilizing equipment, and fitted with radio collars. Their year-long distribution, movements, and behavior patterns are monitored by snow tracking on the ground and from aircraft using signal-receiving equipment. The study is expected to provide some baseline information needed by biologists and land

Profile of a Houndsman

Dawn broke with six inches of new powder on the ground and the skies filled with snow. Bill Dishman roused us from deep sleep. We dressed and washed up, then staggered up the stairs of his Missoula home to a houndsman's breakfast—hot coffee, pancakes, fried potatoes and bacon. We ate eagerly, knowing there would be little time for lunch if we found a fresh lion track.

Bill had already eaten and loaded his hounds into their travel boxes in the pickup and was busy sweeping snow and loading equipment. After we finished second helpings of cakes and a few extras, we rolled down his driveway and headed for a remote winter range.

Bill's colorful stories of past cat and big game hunts kept the truck's heater from putting us to sleep. Between laughs, we glanced along the road for cat tracks. Shortly, Bill spotted the delicate prints of a bobcat that had crossed the road in the new snow. Although the cat was fair game for his hounds and would bring as much as $300 on the fur market, Bill was thinking lion chase that day and wanted an opportunity to show us his marksmanship with a tranquilizer gun.

Bill Dishman is widely respected both as a houndsman and a sportsman. An astute observer and student of nature's teachings, he maintains a high standard of ethics concerning human conduct in the outdoors. "A world of responsibility goes with owning hounds and high-powered rifles," he related to us during a long discussion of Montana's wildlife resources. "Every sportsman must help assure survival of the species he hunts, by working to preserve its habitat and reasonably harvesting nature's limited surplus."

Bill has been taking his own advice for a long time. Even before the Montana bounty on lions was removed, he killed few of those he treed, leaving the cats to be chased and photographed when the opportunity arose again.

Bill Dishman

Although he still buys a lion tag each year, he prefers to spend winter days assisting research on lions in western Montana. In fact, Bill is a key member of the team, providing advice on logistical matters and the grassroots know-how to get the big cats treed, darted, and safely to the ground. His prior knowledge of particular areas and individual lions were invaluable aids in getting the lion studies off to a good start. Bill also scrutinizes the research operation with a keen eye, drawing on a broad sense of practical experience obtained from a lifetime spent in the woods. His acute powers of observation have helped answer some basic questions regarding the life history of this species in Montana.

Although Bill did not initiate the research program, capture guns and drugging darts are nothing new to him. Before state biologists initiated capture-mark-recapture studies in 1971, Bill and his companions purchased the necessary capture equipment at their own expense, marked a number of lions, and provided some of the earliest information available on Montana's lions.

Bill has seen many changes in cat hunting since he got his first hound in the 1960s. Although he doesn't consider himself one of the old-timers, he's been around long enough to see an increase in the popularity of cat hunting with hounds—and the inevitable reduction in season lengths and bag limits. Admittedly, competition for tracks with newcomers has reduced his enthusiasm for the sport. But, while he longs for the old days, he changes with the times, closely watching biopolitical events surrounding lion management and offering advice, often heeded, when called upon.

We continued on up the drainage and parked near a trailhead at the mouth of a rocky canyon. With the hounds trailing on leashes, we snowshoed up a broken trail and on to a low divide bordering another winter range area to the east. After a cold lunch under overcast skies, we snowshoed back to the truck, completing a loop of about six air miles, having located only a single lion track too old to run. Bill must have sensed our disappointment over not getting to hear the hounds open on a fresh track: "Dry runs are just part of cat hunting," he remarked.

To Bill personally, such a day means more than success or failure. Rewards received are varied, and always uncertain. Payment for hours spent is often just the opportunity to see a lone bull elk or to check on an old friend treed and marked in a season past, whose faint sign, like that we found, meant he still lurked among the windswept ridges. For Bill, cat hunting provides winter recreation and responsibility. When he purchases his lion tag, he remembers he's getting both.

managers.

Currently, Montana's lion season runs from Dec. 1 to April 30 of the following year. However, the big cats may be killed only until Feb. 15. Thereafter, lions may only be pursued in a "chase" season and not taken. Strict regulations stipulate that carcasses must be presented to state officials so that the skull and hide can be tagged and appropriate information collected.

Between 50 and 100 lions are killed annually in Montana, mostly west of the Continental Divide. Harvest is highly variable, depending on snowpack and snowfall during the kill season. Most lions killed are treed by hounds, although a few are taken each year by predator callers.

Efforts to manage populations are complicated by the difficulty of determining lion densities and year-to-year population trends. Unlike ungulates, lions cannot be censused from the air because of their secretive habits and inherently low densities. State biologists must rely on harvest trend information and winter track count data provided by hunter questionnaires and limited field surveys. Knowing the limitations of these sources, state biologists have traditionally proceeded cautiously in designing harvest schemes.

Preliminary results of research in Montana and findings of other studies have indicated some noteworthy similarities and differences between lightly and heavily hunted lion populations.

In the Idaho Primitive Area, Maurice Hornocker and his associates identified mechanisms by which individuals of the same sex avoided each other. Territories of males, about 25 square miles in size, overlapped and encompassed those of females to varying degrees. Hornocker found that avoidance between females within the same area and between males on the edges of their territorial boundaries was maintained by olfactory and visual markings—mostly scrapes and piles of debris covering urine or feces, much like a domestic house cat. These signs alerted other adults, and young cats trying to establish their own territories, to the presence of the resident animal. Hornocker found that these cats rarely, if ever, fought. Because lions are solitary predators, they depend on their physical well-being to procure food. An injury may result in immediate or eventual death. Mutual avoidance appears to be an adaptive mechanism whereby lions communicate their presence without injurious encounters that solitary predators cannot afford.

Our studies of more heavily hunted populations in western Montana show that lions follow a similar pattern of spacial separation and avoidance, although home ranges appear larger and more isolated. We have not encountered territorial markings as often as Hornocker did, and suspect that removal of adults from their home ranges disrupts the normal social system. Populations in roaded areas seem to be in a state of flux, and the lack of contact with other individuals apparently leads to a lessened drive to mark territories.

Evidence obtained by Hornocker and other researchers in Idaho and other western states suggests that lion populations in inaccessible areas provide a "core" for production of young lions that may disperse great distances before obtaining a suitable vacant territory. Such young individuals often end up occupying spots in accessible areas where the previous occupant had been killed. We found that young males in the most heavily hunted drainages are quickly harvested, often before they reach adult size. Part of our research is to determine at what rate young individuals replace those removed by harvest and whether males of younger age classes are as reproductively active as those attaining full size. Equipped with this information, biologists will be able to more accurately gauge the impacts of heavy selective pressure on the male segment of Montana lion populations, and to ensure that breeding toms occur in sufficient densities to fertilize available females.

Our data indicate that, although turnover rates of males in accessible populations are high, females in these areas may be as long-lived as those in inaccessible drainages because many hunters avoid killing females. We know of one particular female that has been treed at least seven times by four different houndsmen and has produced many kittens that were potential recruits into the breeding population. In areas we are familiar with, a small number of houndsmen account for most of the lions treed but not killed. These people are dedicated to the welfare of the lion and, through self-restraint, help ensure moderate harvests. This code of conduct has allowed a liberal lion management system unequaled in most other western states. Lion hunting regulations in Montana would no doubt have to be more restrictive if every houndsman exercised the opportunity to take a lion each year.

What is the outlook for Montana's lion populations? Although our knowledge of densities and trends is limited, available information suggests that the big cats are presently stable or increasing in central and western Montana, and expanding their distribution eastward. The reasons for these trends are unknown, but may be tied to increased prey or light to moderate harvests since removal from the predator list.

Clearly, drastic long-term changes in the quality and quantity of lion habitat will reduce and fragment populations. Although the impacts of lion harvest can be controlled by manipulating hunting seasons, the effects of land developments such as housing projects or interstate highways are adverse and permanent. Fortunately though, the state is blessed with an abundance of pristine or nearly pristine land to which this species is highly adapted. We do not have sufficient information to predict the long-term impacts of past and present forest management practices that no doubt affect local and regional population trends and densities, but management that favors deer and elk should also favor the lion.

The future of the lion in Montana looks bright. Unlike some of our other large carnivores, its secretive nature and tendency to avoid direct conflict with humans and livestock allay public concern over human safety and monetary losses. As human populations and demands for Montana's natural resources increase, these attributes may be important in deciding the future of Montana's mysterious cat.■

The Hatch

by Jerry Wells

I suppose it would be safe to say that just about everybody marks the passing of time with a sequence of annual events. The seasons, or birthdays, or the new year are some generally accepted means of marking time. For those of us who take pleasure in Montana's great outdoors, however, other annual events more appropriately mark time's passing.

I, for example, think of things happening before or after a variety of annual events revolving around the recreational opportunities that abound in Montana. The elk bugling season, the first flight of northern waterfowl in the fall, the spring caddis fly hatch on the lower Madison River, the day the ice is first thick enough on Canyon Ferry Reservoir to fish for perch, when the snow is first deep enough to ski into Deerhead Lake—these events are my barometer of time's passing.

But one event stands out from the rest as a point of reference for the year. Things come before it, or they come after. In the long days of early summer, something amazing takes place on some of the rivers of western Montana. It has profound significance for wild trout and for many species of birds. It turns grown men into small boys and has taught the most loving wife the meaning of patience. It's not too bad for the bar business, either. It is the first celebration of summer. It is the salmon fly hatch.

Each year, on many western Montana rivers, there is an emergence of the giant stone fly, *Pteronarcys californica* (known to most of us as the salmon fly). After residing for anywhere from two to four years in the deeper riffles of these rivers in nymphal form, in early summer these giants of the aquatic insect world begin a shoreward migration. They leave the sanctuary of large gravel and fairly deep water and crawl to the river edges. This migration concentrates them in shoreline shallows and they become vulnerable to trout. The trout have just come out of the long winter, a time of inactivity and weight loss. With the warming of early summer water, they are active—and hungry. The concentrations of salmon fly nymphs provide an energy bonanza for trout.

The nymphs that escape feeding trout (and they are many) crawl out of the water and climb onto bushes, trees and large rocks to dry in the sun and wind. After a certain amount of time, the adult salmon fly emerges from the nymphal shell and crawls out to begin drying out its two sets of wings. These are large insects, up to three inches long.

During this terrestrial period, several species of birds prey heavily on salmon flies as the insects complete their metamorphosis. It is an important event to the bird world. Nesting birds are feeding their young and these large insects provide ample and easy prey. Other species have already fledged their young and the availability of salmon flies comes at a critical time in the lives of these young birds. It is a time of plenty for the avian set, and more than one fisherman has wondered if any of the insects will survive.

Plenty of salmon flies do survive. After mating while adhering to bushes and trees, adults that have not been blown into the water by the wind begin an upstream flight that will culminate in their death. Females will drop down to the water surface and lay their huge egg masses to begin the cycle once again. Appearance of egg-laying females and other salmon flies that have fallen into the river with fluttering wings can incite trout to a frenzy. Once they appear on the water, trout begin to seek them out. During the hatch, large trout ordinarily not vulnerable to the angler may become so. During the hatch, I have seen trout taken with as many as 40 adult salmon flies in their stomachs.

Fishing the Madison River (photo: Larry Dech). Mature salmonfly (illustration: Harvey Eckert).

Salmon fly hatches have powerful effects on fishermen. Fishing the hatch can be addicting. Once it happens, you're a goner. Some time around mid-June, a gleam will appear in your eyes and you will fail to hear most of what people say to you. Your sleep will be fitful. Your mind will become preoccupied with scenes of giant trout attacking fluttering salmon flies, with background music of birds chirping, river whispering and the scream of your fly reel as a big trout heads across the river with your fly in its mouth. When this happens, you might just as well head for the action because you won't do anyone any good at home.

Once you get to the river, you can count on witnessing some bizarre behavior, hearing some unbelievable theories, seeing some of the damndest fly patterns and hearing the biggest fishing lies of the year. If you're lucky, you may also experience some fantastic trout fishing. You can also figure on meeting some characters. You may meet a lot of them, too, because the salmon fly hatch is the major social event of the year on western Montana rivers. It is not a time of solitude and if you are a fisherman who needs to be alone, the salmon fly hatch is not for you.

The first order of business is to find the hatch—the catch here is to be in the right place at the right time. You want to be fishing where the salmon flies are flying and fluttering on the water and the trout are in a feeding frenzy. It's not as easy as it might sound. If you have ever driven over a bridge in early summer and looked down to see a group of people shaking the willows and turning over rocks in the river, chances are good they were just fishermen looking for the hatch. If there aren't adult salmon flies on the bushes, but there *are* nymphs along the shore, you can bet the hatch is downstream—these emergences take place in an upstream progression.

The best place to fish a salmon fly hatch is usually from a boat since this is the season of high water. As to what flies to use, there are untold numbers of theories and associated fly patterns. There are flies that sink, some that kind of sink, others that kind of float and others that float like corks. Some are made of balsa wood (if you can believe that), but most are tied with feathers and squirrel or elk hair. Some have rubber legs. Some have woven bodies and others no body at all. Most patterns have orange bodies or tails to simulate the color of the salmon fly's abdomen, but I have seen some with green or purple bodies. Fishermen who frequent these hatches usually have a favorite pattern or two that remain secret until you buy them a couple of beers.

Some people fish with two flies and others with one. I tried three once, but lost them on the first cast to a cottonwood tree.

There are also various theories on the best time of day to fish. There are the dawn fishermen, the midmorning group and the late evening people. There are also fishermen who put their boats in at dawn and make float after float until interrupted by darkness, for days at a time (I am in this group).

There are also favorite sides of a river. There are rivers I have fished only one side of. Somewhere along the line, my fishing partners and I decided that one side was best and that's the only side we fish. The other side of the river might just as well be in a foreign country. Other fishermen fish only the opposite side and others only the middle (they're crazy). Having a left-handed fisherwoman in the boat brings good luck (don't ask me why). I also catch more fish if my Brittany spaniel is in the boat, and I never do very well when I bring along a camera.

Once you have located the general area of the hatch, you might think you have it made. It seldom works out that way, though. I have made five-hour floats along willow banks that were loaded with adult salmon flies and never had a strike. Floats like that produce theories, such as: "They must be feeding at night, so why don't we put some lights on the boat and give it a try."

There have been days when the only samon flies we saw were being eaten by birds. I have seen birds so stuffed with salmon flies that I'm sure they couldn't fly; it was all they could do to sit on a branch and burp. I have seen middle-aged men, pillars of their communities, throwing rocks and screaming at little birds because they figured the little birds had eaten all of the salmon flies.

If you find an area where the salmon flies are thick on the bushes and you just know they will be flying the next day, you begin to worry—what if it gets cold tonight and they don't fly? What if it rains and knocks them into the river when I'm not here?

There are times, though, when everything falls into place and it is possible to experience trout fishing beyond your wildest dreams. If it happens to you, you will never forget it. The bugs are on the water with their giant wings fluttering and the fish are having a field day. At times like this, you have only to control your trembling hands, make accurate casts and the trout will respond. Of course, these are the times your casts end up in bushes or trees and your fly hangs up in your shirt as it zings by you. If you lose your fly at a moment like this, you can bet it will take you three times as long to tie on a new one as it normally would. If you are like me, your next cast will land about 10 feet off the ground in a cottonwood tree.

Spring is here and it's only about 45 days until the first salmon fly hatch. I'm working on a new fly for this year. What I want is one with moveable wings that run on electricity. I figure I could run it from a battery pack in my pocket. All I have to do is run a wire down the center of my fly line and then wrap it around the leader and attach it to the fly. Just press a button in my pocket and the wings will flutter, just like a real salmon fly. Trout will be unable to resist. I'm having some problem finding a motor small enough to fit on a No. 4 hook, but with a little luck, I'll have it ready in time.

I wonder how I'll keep the birds from eating it?■

producing livestock or any other resource, except vegetation. Livestock are simply the vehicle that can accomplish this.

Vegetation is maintained on the range with rest-rotation grazing by timely resting of the range from grazing. All plants—forbs, shrubs and trees as well as grasses—are provided opportunity to grow and reproduce during rest periods. All areas, including riparian sites, are rested and vegetation growth on them is enhanced.

Stocking rate, degree of vegetation use and the desirability and need for spraying, chaining and artificial seeding are decided by the range manager. They are not called for nor are they part of rest-rotation grazing.

Important benefits accrue to wildlife with rest-rotation grazing that cannot be realized with continuous grazing, the method used on most ranges. In a well-designed, three-pasture, rest-rotation grazing system, at least one-third of the range is protected from livestock use the entire year and some two-thirds until about midseason. These portions of the range are thus available exclusively to wildlife and other uses.

For the past several years, I have promoted use of rest-rotation grazing on rangeland in Montana and am firmly convinced that with this type of grazing, vegetation and soil—the basis of renewable resources, including wildlife—can be improved and maintained under livestock use and further, that this type of grazing can be highly beneficial to wildlife.

Department of Fish, Wildlife and Parks Director Jim Flynn and former directors Keith Colbo and Robert Wambach have officially supported efforts to increase understanding and expand application of rest-rotation grazing.

Late in 1978, the Grazing Districts Division of the Montana Department of Natural Resources; the Wildlife Division of the Montana Department of Fish, Wildlife and Parks; the Montana Wildlife Federation, and others arranged a meeting in Glasgow to promote rest-rotation on some grazing allotments on the Charles M. Russell National Wildlife Refuge (CMR) and associated areas outside the refuge administered by the Bureau of Land Management (BLM) and the state of Montana. The Sept. 20 meeting was attended by concerned citizens, including stockmen. Hormay explained rest-rotation grazing to the group and helped facilitate the efforts.

Heavy stocking and long seasons of use by livestock year after year have been major factors in deterioration of the range (DFWP photo: Joe Egan).

Five ranchers expressed a desire to practice rest-rotation on federal/state allotments associated with their private lands. After an October 1978 inspection of these allotments, a rest-rotation grazing proposal was prepared for each by Hormay and presented to the BLM and the U.S. Fish and Wildlife Service (USFWS) in March 1979.

Although no action was taken by federal agencies on grazing proposals when presented in 1979, there has been renewed interest expressed by both the USFWS and ranchers this year. Bob Jantzen, director of the USFWS, recently met with Montana ranchers concerning grazing on the CMR and in a subsequent conversation with the Department of Fish, Wildlife and Parks has said he is supportive of an evaluation of rest-rotation grazing and its compatibility with wildlife on the refuge. The USFWS is in the process of contacting ranchers and several have indicated an interest in participating in this program. An evaluation will provide answers to questions raised by environmental and rancher groups on rest/rotation-livestock-wildlife relationships.

Many will ask: If this is such a good system, why isn't it widely applied? I can only answer that most people, especially agency people, have (or are reluctant to depart from) a "that's the way we've always done it" attitude. Maybe rest-rotation is viewed as a threat to the *status quo.*

The responses in vegetation claimed by rest-rotation will occur, and can be observed on the Matador cattle allotment near Dillon, a BLM allotment. Rest-rotation was implemented on the area in 1976. I saw the area some 10 years earlier; it was severely deteriorated and the riparian sites were really in bad shape.

I visited the area again in the summer of 1980 with Hormay and others. Improvement of the entire area under rest-rotation grazing was incredible. Riparian areas had grown up with vegetation to the point the creeks were hardly visible. All of this was accomplished under rest-rotation, without excluding livestock from the riparian areas. In addition, the area is much better for wildlife now than before rest-rotation was implemented.

The magic cows of the livestock industry—the livestock themselves—are indeed magic. Magic in that they are the only practical vehicle to restore our most precious resources—the soil and vegetation—while benefiting both themselves and wildlife.

Wildlife interests need the support of the livestock industry, and the livestock industry needs that of the wildlife interests. What better vehicle for developing this support than rest-rotation grazing?■

Readers Respond

Fourth "Montana" Periodical

In your Jan./Feb. 1982 issue of *Montana Outdoors,* you carried a feature called, "Three 'Montana' Periodicals." I thought you might be interested to learn of another.

The *Montana Prospector Magazine* has been in business since 1979 and published its first issue in June 1980. The magazine is privately owned, published quarterly and averages 40 to 48 pages per issue. Subscriptions cost $6 per year and the magazine is available at newsstands throughout the state.

The *Montana Prospector Magazine* is dedicated to communicating across the state's vast distances the finer side of Montana life. The magazine concentrates on a strong human interest angle. Specific articles and features include: character studies and profiles of people with unique Montana lifestyles or opinions, people who have made contributions with their lives; interpretive articles on state issues; natural history from the aspect of man as a part of his environment; history with an emphasis on events or people shaping the future, plus an Americana column, cooking, geology, art, photography, fiction, poetry and humor.

The magazine's readers are interested in a stimulating, responsive portrayal of what life in Montana means.—*Betty Staley, publisher,* Montana Prospector Magazine; *Virginia City, Mont.*

Wild Horse Island Loses its Mule

Please keep your readers informed as to how the Arabian stallion and his pal, the mule, progress on Wild Horse Island. "Wild Horse Island: Where the Horse and Mule Roam Free" (*Montana Outdoors,* March/April 1982) was a nice story.—*Stanley Popowicz; Quincy, Mass.*

• *The oldest year-round resident of Wild Horse Island has died. The lone mule—estimated to be 36 years old—died some time during the first week of March.*

Remains of the animal were found on March 25 by Region One (Kalispell) Warden Capt. Louis Kis and Parks Manager Mark Soderlind on the southeastern corner of the island.

The mule and its companion, a black Arabian stallion, were the subjects of an article in the March/April 1982 issue of Montana Outdoors, "Wild Horse Island: Where the Horse and Mule Roam Free." The two have roamed free together for more than a quarter of a century on the island.

At 27, the horse cannot go on much longer. When it dies, the island will be without horses for the first time in more than 180 years. And Wild Horse Island will have lost another special part of what makes it unique.—Ed.

Protect the Flathead

I enjoyed your March/April 1982 issue with its articles on the Flathead very much. Having been born and raised in Polson and St. Ignatius (1938-54), and having made trips back to the area many times, I've noticed many changes in the lake itself. Mainly, the water is not clear and is full of algae in the summer. I can remember the water so clear you could see 15 feet to the rocky bottom. Also, fishing was 10 times better in the '40s or '50s.

I know Montanans are concerned with the changes to this wilderness area and I do not believe there is an answer to solve all its problems. I want to retire at Polson or Bigfork, but not if it is crowded and the lake and wildlife are blighted.

Please keep the Flathead's tributaries and watersheds free of development. Implement strict zoning to control growth. You must do all you can now, before it is too late.

I think more pictures would be appreciated, as witnessed by the readers' response to your Special Pictorial Issue. The mountains here in the East are what we would call "foothills" back in Montana, so I really do enjoy your photos.—*Tom Culbertson; Fredericksburg, Va.*

Enjoys Big Sky Hospitality

I have made several trips to your beautiful state and my wife and I have always enjoyed the sights. I have fished several of your lakes and streams and have been impressed by the hospitality of the merchants and everybody we met.

It is a real treat to be able to still see a place that isn't all hustle and bustle, as it is in too many places. I am retired and now I can relax and enjoy the many good things that Mother Nature has provided for us—and I don't know of a better place to do so than in the Big Sky Country.—*Morley J. Walker; Saginaw, Mich.*

Plaudits

Your magazine is one of the three game department magazines I receive and I consider it to be the one the others are trying to emulate. Thanks for sharing Montana with us Washingtonians.—*Dan Yedinak; Orondo, Wash.*

Southeastern Trophy

I just got this picture back of the mule deer I shot last year and thought your readers might like to see it. Many of your photographs are from the scenic part of the state (western) and I thought I'd show you that the southeastern corner also raises nice trophies!

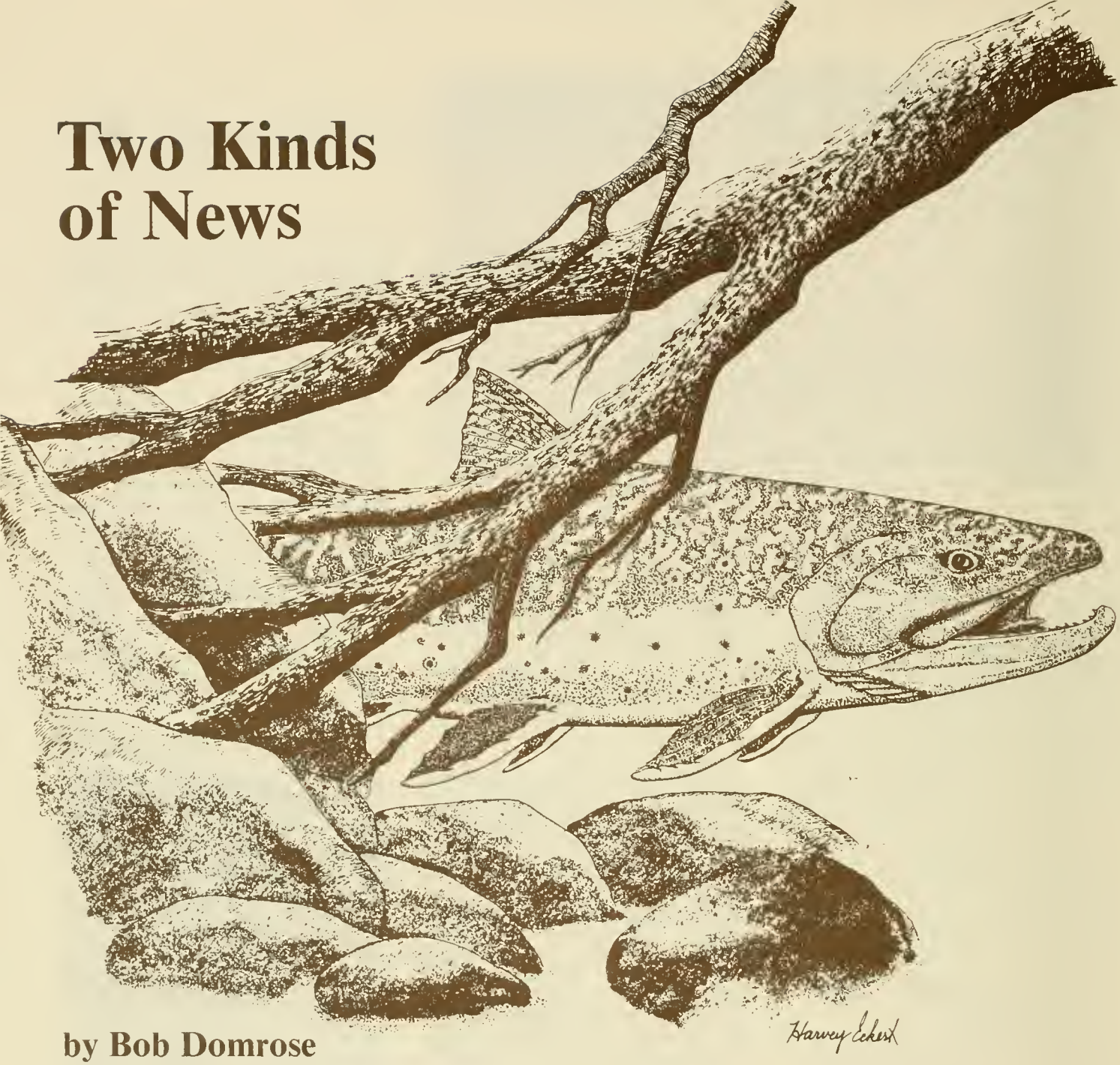
This deer was 9 years old (as aged by a Fish, Wildlife and Parks employee) and had a spread of 33 inches at the

widest part of the rack. He had seven points on each side and was eight inches around the base of the antlers.

I shot him with a .243 on Nov. 16, 1981, just south of Miles City.

I just ordered two gift subscriptions for my relatives because I enjoy your magazine so much. It should be sent out to people wanting to come to Montana.—*Jerry Kimball; Miles City, Mont.*

Two Kinds of News



by Bob Domrose
illustrated by Harvey Eckert

Similar to most people residing in Montana, the brook trout is not native. A native of the eastern United States and Canada, the first recorded brook trout introductions were made in Glenwood Lake near Jefferson City and in Buffalo and Travis creeks near Helena in 1894. Soon after, the headwaters of the Yellowstone and Madison rivers were stocked. By the early 1900s, brook trout had been introduced into every major river drainage and before long became the most widely distributed of all of Montana's trout species.

The brook trout—often called the eastern brook trout—prefers the habitat in small streams and lakes. Like their closely related larger cousins, bull and lake trout, brook trout spawn in fall, usually from September through November. The eggs are deposited in gravel and the developing embryos emerge as fry the following spring in March and April. Most brook trout mature in two years and reach a maximum age of 4 or 5 years. Size depends on habitat conditions: In small streams, they may weigh up to three-quarters of a pound, but specimens in small lakes and beaver ponds may weigh up to five pounds.

Fishermen generally disagree about the contribution of this finny exotic to the fisheries program. Let's examine some of the good and bad characteristics.

First the good news! The brook trout is a favorite among novice anglers and kids because there is no need for expensive special fishing

equipment to entice these little morsels to the hook. Using worms for bait on a willow pole or on an inexpensive spinning outfit is an effective fish-getter. One might categorize this type of fisherman as a true purist—one who uses natural bait as opposed to artificial flies or lures.

Another plus is that brook trout streams or ponds are usually close to town. Chances are, a productive brook trout water is only a short drive or bike ride from most Montana communities.

The brook trout is very prolific and reproduces successfully in waters where only limited spawning habitat is available. Successful spawning occurs in lakes lacking inlet or outlet spawning streams and where the only incoming water is from ground water. The ability of this species to survive and reproduce successfully under a variety of adverse stream habitat conditions—high silt loads, lack of suitable spawning gravels and extremely low flows—is remarkable.

Most brook trout waters are self-sustaining, so they do not need to be supplemented with hatchery fish. Brook trout populations can withstand heavy angling pressure without significant reduction in numbers. To encourage greater utilization of this species, a special limit of 10 pounds, with no number restriction, is in effect in many fishing districts. (Because the limits vary from district to district, check your 1982-83 fishing regulations.)

Now the bad news! Until 1954, hatchery-reared brook trout were used extensively in the state's management program to supplement populations of wild fish. Early-day fish managers were unaware of the implications of the widespread "Johnny Appleseed" stocking techniques. It soon became clear that brook trout adapted well to their new environments and offered strong competition to native species. Streams and lakes once supporting abundant populations of native cutthroat trout fell victim to this tenacious exotic. This displacement feature was particularly evident in cutthroat streams with a low gradient. For example, in nearly all of the lower sections of tributary streams in the Swan River drainage, brook trout have succeeded in replacing native cutthroat trout as the dominant species.

Another disadvantage of brook trout is that they can contribute to a poor quality fishery. A number of lakes and streams west of the Continental Divide don't have what it takes to produce a large number of aquatic insects—which are essential for adequate fish growth. Because of their prolific nature, large populations of small, poorly conditioned brook trout can build up and make for an unacceptable fishery. Most anglers seeking large fish avoid these waters.

Once brook trout become established, they are almost impossible to eliminate, even with chemicals. Eradication programs to favor re-establishment of more desirable trout species are quite often unsuccessful in completely eliminating brook trout populations. Shortly after chemical treatment, brook trout usually reappear and gradually increase, once again becoming the dominant species.

The only attempt to expand the brook trout's range in recent years has been in a very few isolated lakes in northwestern Montana. These are selected closed-basin lakes where reproduction and escape into the immediate drainage is nil. Stocking brook trout under these controlled conditions can be a valuable management tool and provide a quality fishery acceptable to all anglers.

Regardless of whether you are an avid brookie fisherman or happen to despise the pesky little critters, the brook trout is in Montana waters to stay.■

Book Reviews

BUTTE'S HERITAGE COOKBOOK, edited by Jean McGrath, Butte-Silver Bow Bicentennial Commission, P.O. Box 76 (or Art Chateau, 321 W. Broadway), Butte, MT 59701; 1976, 290 pages, $14.95, paper.

Montana has often been called the "land of cowboys and Indians." Well, the Indians may be native; but the cowboys, as well as many other Montanans, can frequently trace their roots back to European descendants. In an effort to bring to our attention a sampling of our culinary heritage, the Butte-Silver Bow Bicentennial Commission presents "Butte's Heritage Cookbook," edited by Jean McGrath.

The variety of this cookbook stretches well beyond European into Chinese, Lebanese and American Indian cuisine, to name a few. And the joy in such variety is well-stated by Brillat-Savarin, an 18th-century gourmet: "The pleasures of the table are of all times and all ages, of every country and of every day."

Each chapter features a different nationality, but more than just recipes, the chapter contains the Butte history of that group. At one time, there were as many as 50 nationalities represented in Butte's population. For example, in 1900, Butte's population was predominantly Irish. "It is said that on the 17th of March, only two kinds of people lived in Butte, the Irish and the ones who wished they were," the cookbook notes.

The cookbook concludes with a nutshell peek at Butte's historical restaurants, and again, at some of their popular recipes. Although this cookbook is going to be especially fascinating to those whose worldly roots took hold in Butte, Mont., soil, I'm sure all readers and their palates will enjoy the fine range of international recipes.

A special note: Proceeds from the sale of this book go to the Butte-Silver Bow Arts Foundation/Art Chateau—a nonprofit center for instruction in, appreciation and enjoyment of the arts.—*Donita Sexton, art director*

Wildlife Shorts

Elephants do not drink through their trunks. They suck liquid up into their trunks and squirt it into their mouths to drink it.

* * * * *

Can animals talk? Animals don't talk as you and I do, but they have the ability to communicate among themselves.

* * * * *

The longest-lived elephant on record lived 69 years.

* * * * *

The body temperature of a hibernating mammal approaches that of the animal's surroundings, often to within one degree Celsius.—*Vince Yannone, youth educator, Conservation Education Division*

Contributors

• As **Mike Aderhold** writes at the beginning of his article: "In Montana, no wild animal is a greater management challenge than the grizzly bear." On one hand, the grizzly is the "subject of a challenging hunt, a memorable trail experience or a rare wildlife observation." On the other hand, it is the living manifestation of wildness and some people regard it as the quintessential wildlife species and even a spiritual force. Yet to others, the bear is only another wild creature in the way of progress. Turn to page 2 for Aderhold's article, "Grizzly Bear: The Animal, the Symbol, the Enigma." Aderhold is the department's information officer for Region 1 (Kalispell).

• Simply put, rest-rotation grazing is a system of periodically resting the range from use. **Joe Egan** explains: "The magic cows of the livestock industry—the livestock themselves—are indeed magic. Magic in that they are the only practical vehicle to restore our most precious resource—the soil and vegetation—while benefiting themselves and wildlife." Turn to "The Magic Cows" on page 8. Egan is the assistant administrator of the department's Wildlife Division.

• "Montana's Mysterious Cat" is a carnivore of many names: mountain lion, cougar, panther, puma and catamount. It is adapted to a broad range of environments—from swamps to deserts—and it does not require wilderness country, as many people believe. In contrast to ranchers in many other western states, Montana livestock owners have few problems with lions and the majority of the [lion] population remains true to natural prey, according to **Kerry Murphy** and **Bart O'Gara.** Their article begins on page 15. Murphy is a graduate student in the Department of Wildlife Biology at the University of Montana, Missoula. Dr. O'Gara is leader of the Montana Cooperative Wildlife Research Unit at UM.

• Each of us has his or her own means for marking time. For some of us, it's a birthday, or the passing of the seasons. For **Jerry Wells,** one event is a point of reference for the entire year; things come before it, or they come after. This first celebration of summer is "The Hatch," the emergence of the giant stone fly—known to most of us as the salmon fly. Since anglers guard their salmon fly imitations more carefully than a generations-old recipe for "fixin's," we'll just warn you that Wells' new pattern for '82 is positively electrifying. Turn to his article on page 20. Formerly a fisheries biologist in Dillon, he has recently been promoted to fisheries manager for Region 3 (Bozeman), a spot not far from salmon fly heaven.

• "Two Kinds of News." First, the good news. "The brook trout is a favorite among novice anglers and kids because there is no need for expensive special fishing equipment to entice these little morsels to the hook," writes **Bob Domrose**. The bad news? "Johnny Appleseed" stocking techniques and the fact that brook trout have adapted well to their new environments has meant strong competition for native species in some streams and lakes. Turn to Domrose's article on page 24. He is a fisheries biologist working out of the Kalispell office on an inventory and management plan for lakes and streams in northwestern Montana.

• Two articles in this issue explore Mount Haggin Wildlife and Recreation Area, a 55,000-acre tract of land astride the Continental Divide in west central Montana. In "Mount Haggin: Living History," **Alan Newell** and **Dick Ellis** trace the prehistoric and historic attributes of the area. The very earliest hunters may have pursued the mighty mammoth or ancient bison, camel, horse or ground sloth. The historic chronicle includes trappers, gold miners, timber operators and the activities of the Anaconda Copper Mining Co. Newell is president of Historical Research Associates, Missoula. The Montana-based corporation offers research services to public and private clients in the fields of cultural resource management and public history. Ellis continues his duties as the parks manager for the Bozeman region and also his abiding interest in Montana history. Turn to their article on page 27.

• Part two is **Mike Frisina's** "Mount Haggin: Management Plans." The department-owned area supplies important year-round range and calving and fawning habitat for elk, deer and moose. A variety of furbearers and nongame animals also inhabits the area and the high mountain streams contain a wide range of game fish. For a look at the department's wildlife management activities and plans—including an experimental grazing system on land the department leases out—turn to page 31. Frisina has been a wildlife management biologist in Butte for more than seven years.

• When gasoline prices were rising in 1979 and many stations were running short, nearly one of three out-of-state visitors to Montana was affected. In 1980, the recreational activities of nearly 63% of Montanans were influenced by the fuel situation. As **Paul Pacini** points out, determining the "most fuel conserving" recreational activities is difficult. Turn to "Energy and Recreation—What's in Store?" on page 34. Pacini is an outdoor recreation planner for the department's Parks Division in Helena.

• The sketches illustrating Pacini's article were prepared for the department by **Len Eckel** of Helena.

• *Montana Outdoors* is delighted and honored to welcome new contributor **Libby Berry** and her front cover painting of a mountain lion. Although she has been a full-time wildlife artist for only five years, her rise to the top of her profession has been meteoric. While many artists painting wildlife are able to recreate a subject "looking like the real thing," few are able to give it the spark of life that is the essence of the wild. She says of her work: "The idea is to lay color on the canvas like a symphony, instead of in disconnected notes the way most artists do. I call the technique 'living oils.' " She works from her home/studio at Lagoon Point, Wash., and credits much of her success to the support and encouragement of her husband, Jim. She conducts classes in "living oils"; for information, write Mrs. Berry at 3492 S. Ronald Promenade, Greenbank, WA 98253.

• Another first-time contributor is self-employed artist **Shirley Johnson** of Missoula. She says of her work: "As you view my work, I hope you, too, will feel an awareness of how important it is to protect and preserve the beauty that surrounds us, for our own enjoyment and for future generations." Thus, her back cover grizzly bear painting, done in pastels, is an appropriate subject. She has been guest artist at shows throughout the Northwest, and has won many awards. She has several limited edition prints available. Her work can be seen at her studio at #6 Greenbrier, Missoula, or at DaVinci's Gallery, Missoula; Grey Wolf Mountain Gallery, Arlee, or Art Unlimited, Whitefish.

• **Harvey Eckert's** meticulous attention to detail makes his pen-and-inks remarkably accurate and true to form. There are two in this issue—the brook trout and salmon fly. His work is available through Nature's Shadow Studio, 2800 Gladstone; Butte, MT 59701.

• Special thanks to the following photographers: **Dean Biggins,** Sheridan, Wyo., **Larry Dech,** Grand Haven, Mich., **Bill McRae,** Fairfield and **Steve Gilbert,** Helena, and to **Dan Becker,** Helena, for his Mount Haggin area map.

Mount Haggin:

Mount Haggin (DFWP photo: Dick Ellis)

Living History by Alan Newell and Dick Ellis

MOUNT Haggin Wildlife and Recreation Area came into existence in 1976 when the Montana Department of Fish, Wildlife and Parks acquired a 55,000-acre tract of land astride the Continental Divide in west central Montana. When put on the market, this richly diverse property, owned by Mount Haggin Livestock, Inc., was recognized to have outstanding scenic, recreational and wildlife values which made it uniquely suited to meeting many of the goals of the department.

Through the cooperation of The Nature Conservancy, a private conservation organization, the land was "held" while state and federal funding sources were secured. Through a combination of matching federal dollars from the Land and Water Conservation Fund (LWCF), and a generous donation by the former owners, property valued at $2.9 million was acquired for an actual cost to the department of $1.9 million. Of this amount, $1,450,000 came from the federal LWCF and the remaining $450,000 came from hunting and fishing license revenues. This combination of gift and federal and state funding made possible an acquisition which guaranteed the public right to use and enjoy over 85 square miles of mountains, meadows and willow-lined stream bottoms endowed with an abundance of natural and cultural resources.

The "natural" riches associated with the Mount Haggin area have long been recognized. Thousands of visitors traversing the area via Highway 274 have thrilled to the natural beauty of the landscape and enjoyed the resident bird and animal life. Since state acquisition, many more visitors have lingered for a closer look. Numerous roads and trails provide access during the summer and thousands of acres are available to the adventurous explorer on foot or horseback. The long winters in this high mountain setting provide outstanding opportunities for snowmobilers, cross-country skiers and snowshoers.

During fall, hunting is the major recreational activity and in summer, more and more fishermen are discovering the bounty of the numerous waters meandering through the property.

Although the natural resources of Mount Haggin have long been appreciated, the area contains other types of resources recognized by

relatively few prior to the department's acquisition. These are the cultural resources, the remnants of prehistoric and historic events represented by subtle archaeological evidence and by the more obvious log and frame structures, many of which are associated with important events in the long history of man's activities in the area.

The Prehistoric Record

Although the "written" record at Mount Haggin extends back nearly 120 years, this is but a fleeting moment in terms of the time man has utilized the area.

Through analysis of stone projectile points and tools found on glacial outwash terraces above the major drainages, archaeologists have determined that Native Americans may well have frequented the area for over 10,000 years.

These early nomadic hunters and gatherers found conditions much different than today. Remnants of the great mountain glaciers still clung to the high peaks and lush grasslands supported an array of wildlife species. The very earliest hunters may have pursued the mighty mammoth and ancient bison, camel, horse and ground sloth.

By 6,500 years ago, however, climatic warming trends had resulted in changes in both plants and animals. The last of the high mountain glaciers was melted, the lush grasses had evolved into smaller, drought-resistant forms and only modern species of game persisted.

During this hot, dry period which lasted over 3,000 years, the prairies to the east could no longer support large herds of grazing animals. Many plains-adapted tribes retreated to cooler foothills and intermountain regions in pursuit of more abundant and stable food supplies. During this time, the Mount Haggin area probably received its heaviest use by prehistoric man.

Starting about 4,500 years ago, a slow reversal of climatic trends to more moist and cool conditions eventually produced a plains environment which would again support vast herds of hoofed animals and provide an abundant food source.

During this period, important cultural changes took place. Large communal bison drives became more common and, about 1,800 years ago, the bow and arrow evolved in North America and supplanted the spear and spear-thrower which had been dominant for many thousands of years. On Mount Haggin, these cultural events are represented by remnants of stone "drive lanes" used in communal bison hunts, and the introduction of "modern" weapons is indicated by the presence of smaller, characteristically shaped projectile points.

Ancient ways of life probably changed little during the centuries before white man's appearance on the continent. Mount Haggin was visited during the temperate months as bands of hunters, on foot, pursued game and collected edible plants.

Remnants of the steam hoist from William R. Allen's Spain mine near French Gulch can still be seen today (above DFWP photo: Dick Ellis). The hope of striking it rich in the mines sustained many miners in what were less-than-lavish surroundings (below photo: University of Montana Library Archives). In 1883, A.W. McCune began building a flume in Mill Creek Canyon to carry water and logs from the Mount Haggin area to the canyon. Parts of it still stand today. The photo to the right (courtesy Montana Historical Society) was taken about 1887 and McCune is pictured standing atop the stacked wood.

• Much of the information on prehistoric man in this article was excerpted from: Smith, Marc B., "Archaeological Investigations in the Deep Creek-French Creek Locality, Deer Lodge County, Montana," *Archaeology in Montana*, Vol. 22, No. 2, pp. 39-87, 1981.

Tribes from the west may have traversed the area en route to and from the vast bison herds of the eastern prairies.

European influence was first felt in the intermountain regions with appearance of the horse in the 1720s. Native Americans were quick to embrace this new opportunity for increased mobility on the warpath and on the hunt. Firearms and trade goods were soon to follow, changing forever the old ways.

The prehistoric period ended in 1805 as Lewis and Clark traversed Montana and compiled the first written record. Within a few decades, trappers and prospectors were entering Montana by the thousands to exploit the fur, mineral, timber and grazing resources. The Mount Haggin area soon felt the impacts of progress and was the setting for significant contributions in the evolution of some of Montana's most important industries.

The Historic Record

Adventurous fur trappers probably moved through the Mount Haggin area during the mid-19th century in search of beaver, but their passage was tenuous and they left no lasting mark on the land. Recorded history began in 1864 with discovery of gold in French Gulch by, of course, two itinerant French prospectors. American, Spanish, German and Chinese miners also entered the Mount Haggin area during these early years and the names given to creeks in the area reflect the diverse ethnic influence—German Gulch, French Creek, American Creek.

The French Gulch Mining District included some of the more important mining properties in southwestern Montana. The district encompassed French, California, American and Oregon creeks and their minor tributaries. During the four years after its discovery, the district yielded between $1 million and $5 million in gold nuggets and dust. The gulch was a roaring gold mining camp, similar to hundreds of others throughout the West. The "town" of French Gulch, at the junction of French and First Chance creeks, was the focal point for miners who worked the many creeks and draws in the district.

The following passage is a reminiscence of one early-day pioneer and lieutenant governor of Montana, William R. Allen, who spent his boyhood years (1871-1877) with his family in the "town" of French Gulch:

> The altitude was 6,500 feet above sea level and snow would fall three to six feet deep, isolating us from the outside world from about November 15 to May 1. The camp cabins were generally a few hundred feet apart. As the pathways were shoveled to each cabin, it piled the snow on either side eight to ten feet high, thus obscuring a view of the cabins and anyone passing through these snow lanes. About all that could be seen of the settlement, from a distance, would be the stovepipe rising above the snow-covered roofs.
>
> —William R. Allen,
> "The Chequemegon"

A road from the Deer Lodge Valley to French Gulch linked the town to the rest of the Territory. Another "pioneer trail" bisected the Mount Haggin area and connected the gulch with the Big Hole Valley. Over this transportation network traveled hundreds of miners, merchants and speculators. The French Gulch District soon became an important Territorial gold camp and a principal stopping-off spot on the trails between the mining regions near Bannack and those at Last Chance Gulch and, later, Butte.

French Gulch was the scene of some excitement during mid-August of 1877. Chief Joseph's band of Nez Perce Indians had left their home near Lapwai, Idaho, on an epic march to Canada. On Aug. 9, the Indians were camped along Trail Creek in the Big Hole Valley when they were attacked by troops from Fort Shaw under the command of Col. John Gibbon. In the ensuing battle, 29 of Col. Gibbon's men were killed and 40 wounded, while 83 Nez Perce died.

Not expecting the Indians to withdraw from the field, Col. Gibbon thought he would need more men to replace his fallen troops. One day after the Battle of the Big Hole, two soldiers arrived in French Gulch on their way to Butte for reinforcements. After changing horses at French Gulch, the troopers headed toward Butte. A day later, a relief column of 200 civilians, including William A. Clark, noted Montana mining capitalist, came through French Gulch on its way to the Big Hole. The men camped at the town on the night of Aug. 11. The anxiety of the townspeople must have been heightened by the presence of this armed camp. Their fears proved unnecessary, however, since Chief Joseph's warriors had secretly abandoned the battlefield on the night of Aug. 9, heading southeast toward Yellowstone National Park.

Some of the Army wounded were treated at French Gulch by doctors who had traveled there from Butte. The crisis over, the relieved miners returned to the more commanding call of the rocker.

As with many western mining camps, prosperity at French Gulch was short-lived. Profits gained by using the pan, rocker and sluice box were soon replaced by those recovered from the hydraulic nozzle. Many undercapitalized miners left the region. But one who returned was William Allen. In 1898, Allen, who had been working for the Anaconda Co., left the firm and took over the family mining interests at French Gulch. Allen acquired timber properties in the area and consolidated most of the placer and lode claims in the district, encompassing more than 800 acres of land. The Spain and McKinley mines were the cornerstones of what became the Allen Gold Mining Co.

Allen continued his mining and timber operations at French Gulch during the first decades of the 20th century. At the same time, he became involved in politics. In 1904, he was elected to the Montana State Legislature as a Republican representative from Deer Lodge County. In 1908, he became Montana's lieutenant governor. Allen retired from politics in 1913, shortly after his mining and timber operations developed financial problems. Perhaps his finances were overextended by the large amount of capital needed to return a profit at French Gulch and his heavy investment in lumber operations. Ultimately, he was forced to sell the property to the Anaconda Copper Mining Co. (ACM).

As evidenced by the extent of Allen's operations, the French Gulch Mining District was an important gold mining area in Deer Lodge County. Although the amount of gold recovered from Montana mines gradually decreased during the early 1900s, French Gulch continued to yield profitable pay dirt.

* * * * *

Establishment of the community of Anaconda in 1883 and the consequent growth of the mining industry in Silver Bow and Deer Lodge counties portended great changes for the Mount Haggin area. Large amounts of timber were necessary not only to convert to charcoal for fueling the smelters, but also to produce short logs or mine "stulls" to support mine tunnels and shafts. With their vast acreages of lodgepole pine, the ridges surrounding Mount Haggin offered a convenient source.

The earliest recorded, systematic timber cutting in the Mount Haggin Area was done in the Mill Creek drainage by A.W. McCune. In fall 1883, McCune received a contract from the ACM to supply the new Anaconda smelter with 300,000 cords of wood. He began constructing a wooden flume in Mill Creek Canyon that was to function intermittently for the next 35 years.

Cultural Resources Management

Passage of the State Antiquities Act in 1973 and the National Historic Preservation Act in 1966 emphasized the responsibility of state agencies to inventory and protect cultural resources on state-owned lands. These responsibilities are especially pertinent at Mount Haggin Wildlife and Recreation Area where significant events took place. Physical remnants of the early mining, logging and agricultural activities still standing today are not only interesting reminders of the past, but serve as a basis for interpreting important parts of Montana's history and as indispensable clues to historians studying the early development of these major industries.

As funds become available, the Department of Fish, Wildlife and Parks will install interpretive signs to help visitors understand and enjoy the rich historic heritage of the area.

Unlike the natural resources at Mount Haggin, the cultural resources are never "renewable." Once altered or destroyed, the structures and artifacts are gone forever, never to be enjoyed or studied by succeeding generations. Many important historic remnants already have been unwittingly or intentionally destroyed. It is the intent of the department to protect and preserve important historic structures and foster a public understanding and appreciation of Mount Haggin's cultural heritage.—*Dick Ellis*

In 1906, 23 years later, Allen extended the McCune flume into the Mount Haggin area. Under a contract awarded to him by the U.S. Forest Service, this enterprising Montanan constructed an elaborate wooden flume—an engineering marvel—to carry water and logs from Mount Haggin to Mill Creek Canyon. The 18-mile flume contained trestles, most over 25 feet high. The highest trestle was 72 feet, and the longest was 775 feet. On its way from French Gulch to Anaconda, the flume passed through numerous rock cuts and one 685-foot tunnel. It required more than 100,000 board feet of lumber and cost approximately $4,000 per mile to build. Remnants of the flume, including standing sections of trestle, can still be seen today.

Timber cut above the flume was sent down the mountainsides by sleds or chutes. It was banked for eventual loading onto the flume. Timber cut below the flume was hauled up the mountainside by cables and a tramway. The end point for the cut timber was a loading yard in Mill Creek Canyon, approximately five miles southeast of Anaconda. From here, a spur line of the Butte, Anaconda and Pacific Railroad carried timber to either Anaconda or Butte.

The French Gulch timber sale was significant not only in the history of the Mount Haggin area, but in the history of the Forest Service in Montana. It is probably the first large timber sale in Region 1 (comprising Montana, North Dakota and parts of Idaho and South Dakota) and it lasted more than 10 years. Furthermore, many of the marking rules and timber selection guidelines anticipated future federal cutting regulations. Gifford Pinchot, chief of the Forest Service from 1905 to 1910, visited the sale in 1908, and was responsible for drafting the last set of harvest regulations.

Numerous contracts with the Forest Service between 1906 and 1911 allowed Allen to continue supplying cordwood and stulls to the ACM. Financial troubles in 1911 cost Allen his government contract and resulted in ACM's Timber Co. assuming control of the Mount Haggin logging operation. ACM worked in the area until 1917.

Much of the 20th century history of the Mount Haggin area revolves around the activities of the ACM and its parent trust, the Amalgamated Copper Co. Because of smelter emissions damaging crops, livestock and timber, the federal government and Deer Lodge Valley ranchers filed claims against ACM. The controversy continued for more than 25 years and involved many lawsuits, replete with testimony by leading air pollution and range experts. It ended in the 1920s with ACM's exchange of damaged federal land in the Mount Haggin area for some of the company's private holdings near Missoula. The company further insulated itself from private claims by purchasing many of the smaller Mount Haggin area ranches. In this manner, the ACM assumed ownership of what is now the Mount Haggin Wildlife and Recreation Area.

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ACM's acquisition of the Mount Haggin area was self-serving in more than one way. Early in the controversy over smelter emissions damage, ACM officials hired Dr. Henry Gardiner, a young Bozeman veterinarian, to establish an experimental ranch in the Deer Lodge Valley as a way of demonstrating that arsenic smoke was not lethal as some believed. Gardiner established his ranch at Willow Glen near Anaconda, but his summer herds ranged in the Mount Haggin area.

During the 1910s, Gardiner began concentrating on developing a purebred sheep flock. In 1923, he traveled to England to study the Hampshire breed of sheep. Impressed with this relatively fast-growing breed, Gardiner purchased a number of yearling rams and imported them into Montana. Gardiner leased the ACM land at Mount Haggin and began running his sheep there.

The Home and Mule ranches (the latter reportedly named for mules pastured there during the logging activities of A.W. McCune in the 1880s) were the centers for summer operations of the Mount Haggin Land and Livestock Co., Gardiner's family-owned corporation. At the ranches, corrals and sorting pens were unusually large and elaborate, reflecting application of Gardiner's breeding system. Some of these ingenious sorting pens still stand at the Mule Ranch.

During the 1920s and '30s, Gardiner's rams won many awards at shows and competitions throughout the United States. The activities of Dr. Henry C. Gardiner and his Mount Haggin Land and Livestock Co. certainly claim distinction in the history of Montana's sheep industry.

The Mount Haggin Land and Livestock Co. continued to operate the ranches under Gardiner and, later, Dr. Harry Ferguson, until 1965 when they were purchased from ACM and reorganized into Mount Haggin Livestock, Inc.

With establishment of the Mount Haggin Wildlife and Recreation Area, the diverse historic, recreational and wildlife values are there to explore. Discover both its natural and cultural resources.

Management Plans by Mike Frisina

MOUNT Haggin Wildlife and Recreation Area lies at the base of the Anaconda-Pintlar Mountains, about 10 miles southeast of Anaconda. The Department of Fish, Wildlife and Parks acquired this area from The Nature Conservancy in 1976 with the objectives of providing diverse recreational opportunities, primarily hunting and fishing, but including others such as snowmobiling, skiing, hiking and photography.

Mount Haggin lies within department Hunting District (HD) 319, as does the Mount Fleecer Wildlife Management Area. Together, these wildlife areas form an important unit by providing essential habitat for game populations within the hunting district. Because department and federal agencies are the major landowners in the hunting district, several thousand acres of high quality wildlife habitat are available for public use.

The Mount Haggin area provides important year-round range and calving and fawning habitat for a number of big game species, including elk, deer and moose. A variety of furbearers and nongame animals also inhabits the area. High mountain streams flowing through the property contain a variety of game fish, primarily trout.

Since logging and livestock grazing leases were in effect at the time of purchase, department personnel have been able to monitor the influences of grazing, logging and recreational use on game and fish populations.

The department's wildlife management activities at Mount Haggin are being conducted to achieve both short- and long-term objectives. The short-term emphasis is to design harvest levels and to implement policies which will enable game populations to increase to optimum levels. Department personnel are conducting resource inventories which will be used to design a long-range comprehensive management strategy for the Mount Haggin area.

Wildlife species of most concern to the sportsman are elk, mule deer and moose, so these species are the main focus of department management activities. Department personnel annually collect information which helps to define seasonal ranges, annual production levels, population distribution and age structure of game populations.

Big Game

The Mount Haggin area contains essential habitat for one of Montana's more important elk populations. This herd probably provides more days of hunting recreation annually (on a per-acre basis) than any other single elk herd in the state. In 1980, HD 319 provided 17,535 days of elk hunting recreation. Because of this intense use, department wildlife biologists spend considerable time monitoring the physical condition and productivity of the population. Efforts include gathering hunter harvest information at check stations during the general season, conducting an annual hunter harvest survey and running ground and

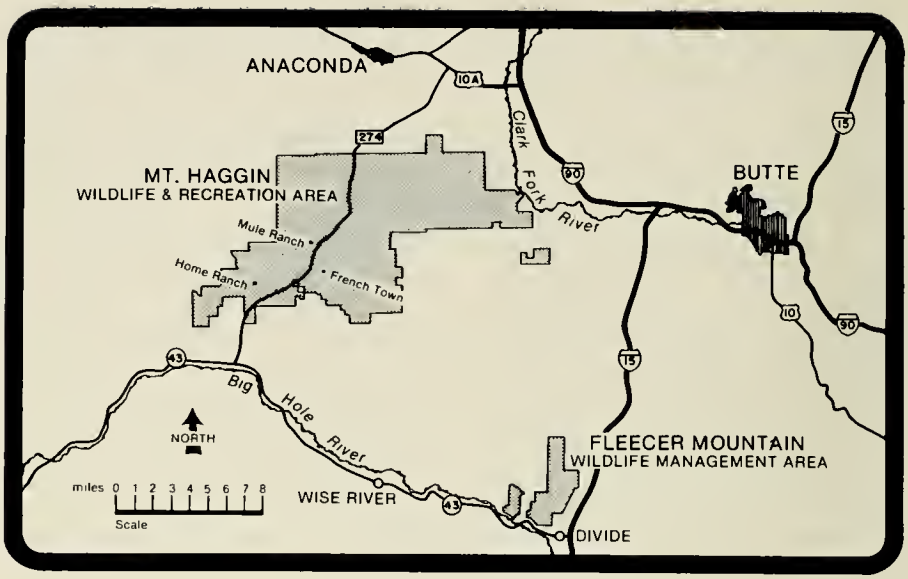
aerial censuses.

Department information indicates the herd has remained highly productive; during the past 10 to 15 years, the overall population has increased dramatically. In spite of heavy hunting pressure, approximately 40% of the bull elk harvested annually are 2½ years or older. The inventory and management program for elk is designed to enable the population to increase to capacity, while allowing as much recreational hunting as possible. In 1980, 15,561 days of deer hunting recreation were recorded in HD 319. An ongoing deer live trapping and marking program provides information on seasonal distribution of animals on and adjacent to Mount Haggin. Some deer are marked with highly visible and distinctive neck bands; others are fitted with neck bands containing a battery-powered signal transmitter. These techniques enable biologists to monitor population trends, distribution, productivity, condition and age structure within the herd. Early and late winter surveys are conducted annually to monitor fawn production and winter survival rates. Information for the past several years indicates excellent fawn survival rates and age structure data collected at check stations indicate a good survival of adult animals. In general, the Mount Haggin deer herd is highly productive, rapidly increasing and approaching the capacity of the habitat.

Mount Haggin contains several sections of high quality moose winter range; moose inhabit the management area during all seasons. The department adjusted permit quotas over the past few years in an attempt to increase the population. Department information indicates the moose population is increasing and the herd is expanding its range into areas previously considered "potential" habitat. Department biologists will conduct additional inventory surveys to determine distribution, production and survival rates.

Furbearers and Predators

Mount Haggin provides habitat for a variety of furbearers, with beaver the species of main concern.



Trapping is allowed and is administered through a random drawing system. Five trappers are issued permits annually; each permit holder is assigned an area. Each is allowed to trap 15 beaver and the limits for other furbearers are described in the statewide trapping regulations.

Animals trapped on the Mount Haggin area are examined to determine age structure of the population, reproductive rates and general physical condition. When combined with aerial winter food cache count surveys, this information will enable department biologists to estimate population levels and establish refined trapping quotas.

In addition, the department issues four predator trapping permits annually, also through a drawing system.

Nongame Species

A variety of nongame animals inhabit the Mount Haggin area and department biologists will conduct a general nongame species inventory when work on the major game species nears completion. The sandhill crane is the species of main interest to the public; department personnel are now determining sandhill crane distribution and habitat requirements.

Fisheries

Aquatic resources of Mount Haggin include part or all of 28 named and numerous unnamed streams. All but one of the major drainages lie on the east side of the Continental Divide and drain into Deep Creek, a major tributary of the Big Hole River. These high mountain drainages offer opportunities for secluded fishing for brook, cutthroat and rainbow trout, mountain whitefish and burbot. Colorful, "chunky" brookies are abundant here and represent an untapped fishing resource. For the angler who enjoys catching lots of pan-sized trout in scenic, secluded mountain meadows, Mount Haggin offers endless possibilities.

Timber Harvest

With the Mount Haggin purchase, the department acquired part of an existing timber contract with the Louisiana Pacific Corp. The contract permits renewal in five-year increments for up to 20 years total. Approximately seven years remain. This contract was not designed with wildlife values as the primary consideration. Road building and logging activities have and will continue to reduce the quality of fall security cover for deer and elk. Because increased hunting pressure has gone hand in hand with logging development, the department is very concerned about loss of fall security habitat.

The most effective solution is a road management plan which includes a reasonable amount of public access while providing adequate cover for the animals throughout the hunting season. Department personnel are working on such a plan, which encompasses slash disposal and other post-logging

The Mount Haggin Wildlife and Recreation Area contains essential habitat for one of Montana's more important elk populations. Department efforts to gather information about the herd include both ground and aerial censuses (DFWP photo: Terry Lonner).

operations to aid in rapid reforestation.

The Long Tom segment of the Montana Interagency Cooperative Elk/Logging Study was adjacent to Mount Haggin. Conclusions resulting from that study will be valuable in solving elk management problems associated with logging.

Livestock Grazing

The Mount Haggin area has a history of intensive use by domestic sheep, cattle, horses and mules. As a result, most of the range is in less than top condition.

A five-year grazing lease with Mount Haggin Livestock, Inc. was part of the purchase agreement. Under terms of the lease, annually the department was required to provide 8,000 animal units per month (AUMs) of livestock grazing over the entire management area between June 15 and Oct. 15. During this lease period, which expired Oct. 15, 1980, department personnel closely monitored cattle distribution in relation to that of wildlife. Biologists determined cattle grazing intensity and range condition and considered applying rest-rotation grazing principles.

After evaluating past livestock and wildlife use, department personnel designed an experimental grazing system for part of the management area. This system incorporated rest-rotation grazing principles developed by August Hormay.* During initial planning, wildlife management and public recreation were given priority over livestock grazing. Excluded from livestock grazing were elk and mule deer winter range, a portion of the riparian (streamside) and meadow habitats, and areas of marginal value to livestock. Once elk and mule deer populations have reached their potential, department personnel will decide whether or not livestock grazing is appropriate on winter ranges. The ungrazed riparian and meadow areas serve as the control for comparison with grazed areas.

That portion of the area receiving livestock grazing was divided into three pastures and grazing practices strictly follow rest-rotation principles (see related article, "The 'Magic' Cows," on page 8). One pasture is grazed from June 15 to the time when seeds are ripe (mid-August); livestock are then moved to the second pasture which is grazed from seed-ripe time to Oct. 15. The third pasture is rested for the entire grazing season. The following year, the rotation sequence is started in the pasture that received total rest the previous year. The cattle are rotated to allow each pasture, over a three-year period, to receive one year of total rest, grazing to seed-ripe time and grazing from seed-ripe time to Oct. 15.

This grazing program enhances plant vigor, allows seedlings to become established and improves range conditions. Two of the three pastures include important spring, summer and fall elk range. According to the grazing schedule, at least one of these pastures is left ungrazed by cattle during the time it is used by elk.

In September 1980, the Montana Fish and Game Commission approved the department's implementation of this concept and the entering of a lease with Mount Haggin Ranch (a partnership entirely separate from Mount Haggin Livestock, Inc.) for 4,000 AUMs of cattle grazing between June 15 and Oct. 15 annually. This lease went into effect on June 15, 1981 and has since been assigned to Greg and Patricia Seitz, owners of the adjacent Willow Glen Ranch.

This program is experimental. The department is attempting to graze domestic livestock while at the same time improving range condition and maintaining maximum wildlife populations. As biologists determine response of wildlife populations, they can adjust the livestock grazing program as necessary. Although secondary to wildlife, the department intends to make livestock grazing an integral part of the Mount Haggin management program. It is anticipated this program will demonstrate to state and federal agencies and to the public that livestock grazing and optimum wildlife populations can both thrive under a well-designed management plan.

At Mount Haggin and elsewhere, the ability of wildlife managers to maintain wildlife populations in the presence of land development and other demands for natural resources will ultimately determine the quantity and quality of wildlife resources available to future generations.■

*Hormay, A.L., "Principles of Rest-Rotation Grazing and Multiple-Use Land Management," 26 pages, USDA, Forest Service, Washington, D.C., 1970.

Energy and Recreation—What's In Store?

by Paul Pacini

ON FIRST thought, there would seem little relation between recreation and the theory of evolution. But recreationists' responses to the energy situation of the past several years resemble an evolutionary change.

To illustrate: Birds evolved from reptiles, as changing conditions, probably relating to food-gathering competition or self-defense, prompted some of them to start gliding from the treetops. Some reptile species with bodies improperly designed for gliding perished. Charles Darwin referred to this preservation of "favorable variations" and the rejection of "injurious variations" as "natural selection."[1] Similarly, recreational habits have undergone an energy-economic "natural selection" since the 1973 and '79 fuel shortages.

During the summer of 1979, approximately 30% of the out-of-state visitors to Montana were influenced by the price or availability of gasoline.[2] Gasoline prices were rising (86 cents per gallon for self-service regular in July 1979) and many stations were running short. As a result, nearly one of three nonresidents took shorter trips, stayed longer once they arrived at a destination, took fewer side trips, canceled some trips or used a less expensive mode of transportation, usually a form of mass transit.

By the end of the summer of 1979, visitation was down at Glacier National Park by 10% and Yellowstone National Park was down by 28% from the previous year—"natural selection."

In 1980, the recreational activities of nearly 63% of Montanans were influenced in the same way by the fuel situation. Twenty-one percent of Montana's residents said they would participate in activities using less fuel,[3] but what activities are these? Most of us probably have our own answers—hiking, car camping or fishing might be some common responses.

In reality, it is not easy to identify the recreational activities which use the least fuel.

The Energy Consumption Ranking Chart compares the average fuel requirements of 19 outdoor recreational activities in Montana.[4] The comparisons of fuel consumption for each activity were made in four ways: (1) total consumption of all participants in Montana, (2) consumption per person per year, (3) consumption per person per occasion and (4) consumption per person per hour of participation.

In many cases, these four perspectives provide startlingly varied results. For example, car camping is relatively consumptive overall (column one). This is largely due to its popularity and the fact that it usually involves driving long distances to arrive at a favorite campground before pitching a tent for the weekend. However, looking at consumption per person per year (column two), car camping becomes more conservative. Column three indicates the activity again approaches the consuming end of the scale on a per-occasion basis, probably due to the long driving distances. It becomes very conservative on a per-hour basis (column four) because each trip usually involves a long stay.

So, is car camping a relatively conserving form of outdoor recreation? It all depends on how you look at it. This sort of leapfrogging between columns on the chart is not peculiar to car camping; it is more often the rule than the exception, as the chart indicates.

One can see that determining the "most fuel conserving" recreational activities is difficult. If we could make this determination, would the fuel savings be significant? In 1976, only 4.4% of all car fuel consumed in this country was used by snowmobiles, motorcycles, recreation boats and recreational vehicles combined.[5] The gasoline consumption for automobiles probably would have been higher if these activities were banned because many people would have substituted recreational auto trips for motorbike or motorboat outings.

Should recreation-managing agencies try to influence recreators—or try to direct them—toward forms

of recreation that consume less energy?

Most past recreation planning and management has been largely responsive and reactive. For example, in the 1950s, who could have predicted the boom in pickup campers or snowmobiles, both of which blossomed in the '60s and '70s? Major recreation trends are born in the imaginations of inventors, manufacturers, retailers and advertisers, and dreams can rarely be predicted. In response to changing conditions and technology, new trends or "successful dreams" have emerged and probably will continue to do so. Downhill and cross-country skiing, motorcycle riding, tennis, river floating, sailing and other "traditional" activities have surged in popularity in the past decade. What's next—powered hang gliders, ultralight aircraft. . .?

If the future reflects the past, recreation-managing agencies will pretty much react to emerging trends as they become established pastimes. But should this be so, especially in light of the energy situation? Since we live in a democracy and people rightfully resent unnecessary government intervention, the proper answer is probably a qualified "yes." Without question, people *will* continue recreating. If fuel availability or price become a problem, people—if left to their own choices—will respond to the situation through "natural selection."

Any decision concerning the role of recreation-managing agencies will be strongly influenced by the perceived world energy situation. Experts' perceptions of this situation don't agree, however. Fossil fuel is a finite substance; there is only so much of it, and someday it will be gone. Nobody seems to argue that point. However, the debate can become spirited indeed on the "depletion date" of fossil fuels and the eventual availability of synthetic fuels.

One line of thought is that the slowdown in economic activity in the United States and Europe is the main reason that energy use and imports have fallen in this country. Some experts believe we are being misled by predictions that energy prices and supplies will remain stable. They reason that when the recession ends, energy consumption will grow. They fear that if the public and the energy industry become complacent—if our conservation efforts falter—we will again be plunged into an energy crisis of short supply and high prices. Any major Middle East political crisis could be disastrous to the delicate balance of supply and demand.

Apart from the political and economic aspects of energy supply, the world may simply not have that much petroleum left. Earl T. Hays, formerly chief scientist with the U.S. Bureau of Mines, wrote an article in the January 1979 issue of *Science* magazine, "Energy Resources Available to United States 1985-2000." He noted:

> Our production of oil and gas passed a peak in the early 1970s and there is no resource base to justify predictions of increased yields. Finding rates for petroleum, natural gas and uranium are less than half of what they were 20 years ago.
>
> It must be recognized that the United States never had, and never will have, petroleum resources to sustain infinitely the production levels of the last 25 years. In effect, we have been living off our capital all this

ENERGY CONSUMPTION RANKINGS OF SELECTED OUTDOOR RECREATION ACTIVITIES

Estimated Total Energy Consumption	Thousands of Gallons of Gasoline	Energy Consumption Per Person Per Year	Thousands of BTUs	Energy Consumption Per Person Per Occasion	Thousands of BTUs	Energy Consumption Per Person Per Hour Of Participation	Thousands of BTUs
(1) Pleasure walking	10,166	Trail biking	9,567	Elk hunting	1,000	Pleasure walking	303
(2) Car camping	8,387	Deer hunting	7,188	Off-road driving	806	Cross-country skiing	148
(3) Trail biking	7,856	Off-road driving	6,444	Deer hunting	719	Boating	119
(4) Deer hunting	6,813	Pleasure walking	6,061	Trail biking	683	Snowmobiling	107
(5) Off-road driving	6,700	Downhill skiing	6,033	Car camping	667	Horseback riding	105
(6) Fishing	6,659	Jogging	4,667	Boating	631	Off-road driving	101
(7) Boating	5,377	Boating	3,788	Downhill skiing	603	Downhill skiing	101
(8) Jogging	4,077	Car camping	3,333	Canoeing (overnight)	583	Spectator sports	78
(9) Spectator sports	2,782	Horseback riding	3,137	Backpacking	567	Deer hunting	72
(10) Horseback riding	2,576	Elk hunting	2,581	Snowmobiling	535	Trail biking	49
(11) Snowmobiling	1,728	Snowmobiling	2,674	Horseback riding	314	Fishing	46
(12) Elk hunting	1,646	Fishing	2,593	Pleasure walking	303	Canoeing (day use)	42
(13) Canoeing (day use)	1,638	Spectator sports	2,123	Cross-country skiing	297	Bird hunting	35
(14) Downhill skiing	1,502	Cross-country skiing	1,783	Bird hunting	276	Jogging	26
(15) Cross-country skiing	1,137	Canoeing (day use)	1,500	Canoeing (day use)	250	Car camping	14
(16) Canoeing (overnight)	1,092	Backpacking	1,167	Fishing	185	Elk hunting	13
(17) Bicycling	531	Canoeing (overnight)	1,000	Spectator sports	117	Bicycling	9
(18) Backpacking	510	Bird hunting	690	Jogging	26	Backpacking	8
(19) Bird hunting	359	Bicycling	370	Bicycling	19	Canoeing (overnight)	7

For more detailed activity consumption data write: Department of Fish, Wildlife and Parks, Parks Division, Helena, MT 59620, and ask for the study, "Estimate of Energy Consumption by Outdoor Recreation Activities."

time and cannot postpone the day of reckoning indefinitely. Talk of rising petroleum and gas production for long periods is both immoral and nonsensical. Whatever slight gain might be achieved for a very few years will be at the expense of the youth of today. Predictions of sustained increased production deny the records of 50 years of experience with the exploration, development and extraction of liquid hydrocarbons. There is a finite amount of easily recovered petroleum in this country and no act of Congress or false optimism of government, industrial or academic planners can add to our natural resource base.

The American public has been put on notice that the good old days of cheap and plentiful energy are drawing to an end. But are they?

Liquid petroleum constitutes only 1%[6] of the oil in the earth's crust; the other 99% is "heavy oil," oil shales and tar sands. They are almost completely unexploited. It has been cheaper to drill for liquid petroleum, but this picture is now changing. Since the cost of conventional liquid petroleum has risen by leaps and bounds, heavy oils are becoming very attractive[7,8] and further development of what have been considered "depleted reservoirs" is becoming economical.[9] However, there could be a heavy environmental price tag attached to this extraction if safeguards are not put in place and enforced.

While additional sources of energy are being developed, America's conservation efforts are beginning to pay dividends. In the United States, 7% less energy was required per unit of the Gross National Product (GNP) in 1979 than during the 1960-69 average. If present trends continue, a 33% reduction of energy consumption per unit of GNP should be realized by the year 2000 over the 1960-69 average.[10]

Fuel substitution is another form of petroleum conservation. Outdoor recreation relies heavily on travel, but it is in the transportation sector that little fuel substitution is expected during the balance of this century.[11] Nevertheless, substituting natural gas, coal and wood in other sectors such as industry free petroleum for use in transportation. And these substitutes are significant. Coal's contribution is expected to rise from 19% of all energy consumed in 1979 to 30% by 2000.[12]

This increase in petroleum supply, regardless of whether it is due to substitution, conservation or increased production, should stabilize gasoline prices. During the summer of 1981, gasoline prices around Montana did, in fact, drop slightly, $1.35.8 per gallon for self-service regular in April 1981, versus $1.32 per gallon in September 1981.[13] Coincidentally, annual visitation at Glacier and Yellowstone parks had increased by 21% and 25%, respectively, over the previous year by the end of August 1981.[14]

But we have only concerned ourselves with the future of conventional fuels, and we are just on the horizon of the synthetic fuel era. Synthetic

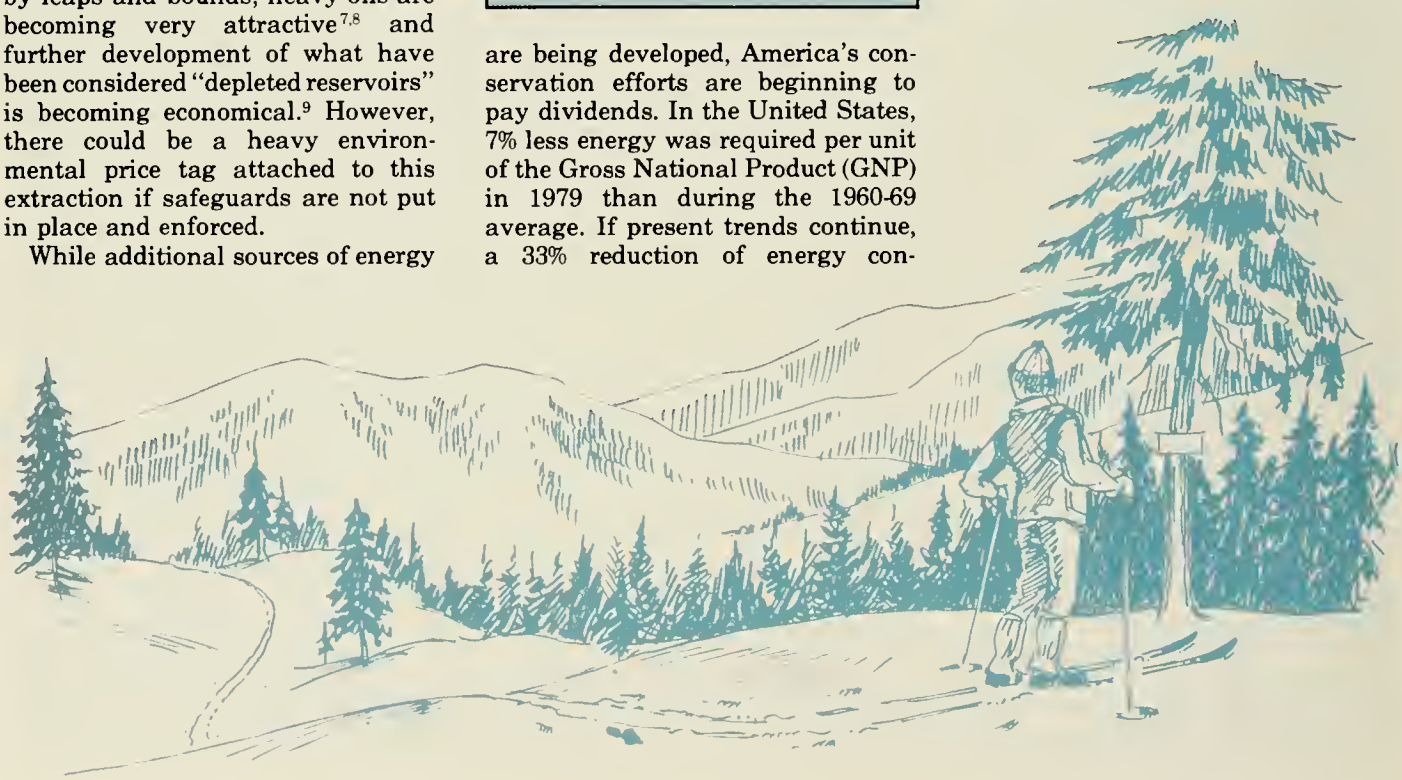
What is SCORP?

The acronym SCORP stands for Statewide Comprehensive Outdoor Recreation Plan and it describes ways recreation needs may be satisfied through actions at all levels of government.

SCORP is required by the Land and Water Conservation Fund (LWCF) Act of 1965, an act passed by Congress to increase outdoor recreation opportunities for Americans. The fund was built from the sale of federal surplus real property, the federal motorboat fuels tax and outer continental shelf mineral receipts.

About 60% of the fund is used to provide grants to states and, through states, to their political subdivisions (cities and counties) for acquisition and development of public outdoor recreation areas and facilities. Project grants must be matched by an equal amount of nonfederal funds. Before a state can share in this funding source, it must produce a SCORP. The Department of Fish, Wildlife and Parks is responsible for producing Montana's SCORP and administering the state's LWCF revenue.

Since 1965, Montanans have benefited by over 26 million federal dollars being matched with equal amounts of state or local dollars to provide over 500 recreational facilities—swimming pools, tennis courts, golf courses, park lands, state recreation areas, fishing access sites and more—all across the state.—*Paul Pacini*



fuels are expected to supply 5% of the gasoline demand in this country by 1990, and 18% by 2000.[15] Alcohol from sugar cane currently accounts for close to 20% of Brazil's gasoline consumption, and the country has plans to increase that to 80% to 85% in the 1990s.[16]

The Energy Division of the Montana Department of Natural Resources has on file six potential commercial synthetic fuel plants in Montana which would use coal to fire the plants.

Perhaps the most hopeful synthetic fuel of all is referred to as the "fuel of the future": hydrogen. In its pure elemental form, this gas burns cleaner than any other substance and its only product of combustion is water vapor. Conventional internal combustion engines can be easily modified to burn hydrogen. One of the most promising sources of hydrogen is from coal gasification, and coal is abundant in Montana. Along with coal gasification come certain environmental concerns which technology must address before such a process should be considered.

There will undoubtedly be many short-term fluctuations—some violent—in the world energy picture long before the last drop of petroleum is squeezed from the earth. There is absolutely no doubt that recreation trends will be affected by both short-term and long-term future energy supplies and prices. But recreation is a significant positive influence in our daily existence, relaxation to compensate for the stress of modern life. Regardless of the energy supply future, recreation will not go the way of the passenger pigeon. It may, however, evolve to a point where recreators, if given a free choice, will reflect the changing fuel situation through the process of "natural selection."

How should recreation-managing agencies respond? Perhaps one of the most direct responses is to set a good example. Like most Americans, our government agencies might find ways to conserve. State and federal recreation-managing agencies have experimented with synthetic oils, additives, gasohol, propane, radial tires, four-cylinder engines, eliminating unnecessary driving and combining trips to conserve fuel. These efforts must be continued. But, of more immediate concern to the individual recreator, is if and how these agencies should influence specific recreation activities for the sake of fuel conservation:

- Should they allow the recreator to decide what he/she can afford?
- Should they try to anticipate energy trends and prepare to accommodate new demands?
- Should they attempt to identify and encourage low-cost and fuel-efficient activities?
- Should they attempt to identify and curtail the most energy consumptive forms of recreation?
- Are there other actions which government should undertake?

What do *you* think?

* * * * *

Recreational energy consumption has been identified as an issue in need of further study in the Statewide Comprehensive Outdoor Recreation Plan (SCORP). This article was prepared as a portion of the 1983 SCORP. It is part of a public review process in which you are invited to participate. Your comments and recommendations will assist in the development of statewide goals and objectives. To let us know what you think, write: Department of Fish, Wildlife and Parks, Parks Division (SCORP '83), 1420 E. Sixth Ave.; Helena, MT 59620.■

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[12] *Ibid.*

[13] "Fuel Gauge Report," American Automobile Association, April 14, 1981 and Sept. 3, 1981.

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S Johnson
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